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Associations between Material Hardship, Acculturation, and Stress
Among Socioeconomically Disadvantaged Latinx Mothers and their Children

By

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DISSERTATION

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I. Dedication

I dedicate this work to the loves of my life: to my ever-supportive husband Mike, who encouraged me to pursue my passions and did the work of two parents so that I could have space and time to do so, and who loved me unconditionally no matter how stressed I became; to my sweet son Benjamin, whose endless curiosity and thirst for knowledge remind me daily to ask more questions and search harder for thoughtful answers; and to my spirited daughter Juliet, a model of courage and creativity, who has taught me to strive for nothing less than to be the leader of the pack.

“I love you through and through. Yesterday, today, and tomorrow too.”

-Bernadette Rossetti-Shustak

II. Acknowledgements

First and foremost, I would like to acknowledge the tremendous generosity of the Gordon and Betty Moore Foundation, Helen M. Thompson, and the Fields-Messersmith family. Their financial support allowed me the privilege of studying in a state-of-the-art school and graduating without the significant burden of debt that so many students in our country face. I cannot thank you enough for giving me this opportunity of a lifetime.

I gratefully acknowledge the support of Dr. Janice Bell, my dissertation chair and academic advisor, who dedicated so much time to meeting with me over the past 4 years, and patiently helped me transform into the novice researcher I am today, always challenging me to learn more and do better. I am forever thankful to the other members of my dissertation committee, Dr. Christiana Drake, Dr. Erik Fernandez y Garcia, and Dr. Laura Gottlieb, who provided me with endless mentorship and support during my doctoral study and dissertation research and writing, on top of their already overflowing plates. I would also like to acknowledge the role of my qualifying examination chair, Dr. Jill Joseph, in helping me get through the tremendous hurdle of advancing to candidacy. I am grateful to the research teams at SIREN and McGill who partnered with me in this work and taught me so much along the way. I learned so much from each of you and so appreciate how much you helped me stretch my mind in ways I never knew possible. Thank you all for being amazing role models and reminding me who I want to be when I grow up.

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my research with sincere interest, or just stopped to check in and see how I was managing, you all kept me going in ways you will never know. I am also truly grateful to the children and families I have served over the years as a PNP, and the participants of the HASII study, who were the true inspiration for this research and the best models of resilience I will ever know.

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Finally, I would like to acknowledge the tremendous support I received from my family and friends over the past 4 years. I am grateful to my parents, my brother, and my in-laws for your unwavering support of my goals and for truly being the “village” for my family so that I could make this dream come true. Thank you to all my friends for your love and support and for remembering what I look like even when I was MIA for months at a time. And there are not enough pages in the universe to thank my husband, Mike, and my children, Benjamin and Juliet, for being so patient and understanding with me during this time and for filling my heart everyday with more love than the day before.

Thank you all so very, very much.

III. Abstract

Background: Emotional health is associated with mental and physical wellness for children and adults. Latinx populations may be particularly vulnerable to emotional dysfunction, due to higher rates of economic hardship and complex social influences in this group. Little is known about relationships between material hardship and both emotional dysfunction or stress in Latinx families.

Methods: This two-part study of over 400 caregivers and their children utilized data from the enrollment phase of a previous randomized clinical trial. In part one, we used multinomial regressions to examine associations between level of household social need or select household needs, maternal acculturation, and self-reported maternal emotional problems or perceived stress. In part two, we used logistic and multinomial regressions to examine how the predictors of maternal perceived stress, maternal hair cortisol concentration (HCC), and level of household social need or select household needs, were associated with our primary outcomes of child emotional function and child HCC. In both studies, we controlled for important sociodemographic and health covariates to better isolate the individual effect of each independent variable.

Results: Both emotional dysfunction and social needs were high for the sample. Household social needs predicted worse maternal emotional problems and stress outcomes but were not associated with child emotional function or HCC. Maternal perceived stress predicted child emotional dysfunction but not child HCC. Maternal HCC predicted child HCC, but only in those with high concentrations in both groups. Spanish as preferred language appeared to represent potential protective factors against maternal emotional problems.

Conclusion: Household social needs were associated with emotional problems and stress in Latinx mothers, and maternal stress was associated with emotional dysfunction or stress in their children. Less acculturated mothers may experience protective factors that reduce their risk of emotional problems related to social needs. Our findings support the need for integrated mental health and social needs screening and interventions in clinical settings that serve at-risk mothers and children. More research is needed on the unique cultural factors that may influence emotional health and stress in both Latinx mothers and children, as well as the role hair cortisol can play as a measure of stress in this population.

III. Introduction

Background

The etiology of emotional dysfunction – primarily depression and anxiety – in children is multifactorial, and is influenced by genetics, temperament, socio-demographic factors, physical health, and environmental stressors.¹ Perhaps one of the most significant environmental predictors of child emotional health is parental mental health, especially that of the child’s mother.²⁻⁷ Poor maternal mental health may negatively impact secure attachment and bonding, lead to harsh or negative discipline, or otherwise impede supportive caregiving.^{5,6,8-11} Emotional health in childhood is positively associated with development, physical health, interpersonal relationships, and academic performance, as well as emotional and physical health in adulthood.^{8,12} Depression and anxiety in adults are associated with other psychiatric disorders, including substance use disorders, suicidality, and poor quality of life,^{13,14} and anxiety is also associated with physical disorders such as gastrointestinal, respiratory and cardiovascular disease.¹⁴

Economic disadvantage is associated with emotional dysfunction in both children and adults.^{15,16} Economic disadvantage is sometimes defined in the research using federal income poverty level numbers, though growing evidence suggests that material hardship—difficulty meeting basic needs for safe and healthy living, such as housing or food¹⁷—affects many people above either state or federal poverty level cut-offs.^{3,18,19} While increased emotional symptoms in children have been shown to be associated with increased income-related parental stress,²⁰ the impact of families’ experiences of material hardship on children’s emotional health has not been well-explored. There are also important gaps in our understanding of the physiologic impact of material hardship and parental stress, despite growing awareness that chronic stress stimulates

hormonal and inflammatory responses in the body that can have deleterious consequences for physical health.^{21,22}

Several studies show that poor mental health specifically in Hispanic or Latinx (herein referred to as Latinx) mothers is related to poor physical and emotional health in their children.^{4,9,23,24} Latinx mothers and children in the U.S. experience high economic hardship and discrimination that may make them particularly vulnerable to emotional dysfunction, compared to White non-Latinx populations.²⁵⁻²⁸ To better support the well-being of Latinx mothers and children, more research is needed to understand the complex interplay of household material hardship, maternal stress, and maternal and child emotional health, in the context of their unique needs. The current paucity of evidence may be due in part to barriers in participant recruitment or data collection unique to this group.^{25,29} Much of the current research that exists for these topics is based on large survey-based population studies that may not accurately represent Latinx families, either secondary to under-sampling or the potential for social desirability response bias.²⁹ Some theorize that less acculturated Latinx immigrants experience genetic, lifestyle or cultural protective factors over their U.S. born or more acculturated Latinx counterparts, that contribute to better health outcomes.³⁰⁻³³ The benefits of healthy lifestyle habits or social support decrease as immigrants spend a longer time in the host country and presumably become more acculturated. There is still conflicting research in this area, as well as little evidence on whether the health paradox applies to the impact of material hardship on health outcomes in the context of different levels of acculturation.

Conceptual Framework

We based on our work on a conceptual model (see Figure 1) that was adapted from a framework originally developed by Yoshikawa, Aaber, and Beardslee: the “Conceptual

Framework for Effects of Poverty on Child and Youth Mental, Emotional, and Behavioral Health.”³⁴ The Yoshikawa framework includes concepts from earlier conceptual models related to poverty and stress, including a model from Gershoff that highlights the influence of family income and material hardship on child social-emotional competence.¹⁸ In the Yoshikawa framework, the pathway from poverty to child emotional health includes four domains: selection factors, dimensions of poverty, mediating mechanisms and child outcomes.³⁴ Selection factors contribute to two interrelated dimensions of poverty: absolute (defined as low family income) and other (material hardship, relative and asset poverty or social exclusion). These dimensions of poverty themselves influence three groups of mediating mechanisms: institutional (schools, jobs, neighborhoods, health care), relational (parent/child security, adult or parent/child conflict, parenting), or individual (parental or child stress, parental mental health, parental or child neurophysiology, child behavior). Finally, each of these mediating mechanisms impacts child outcomes, including physical health and development, mental health, and cognitive and language development or learning.

Our adapted framework isolates the factors, dimensions, and mechanisms from the Yoshikawa model most specific to our research aims – race-ethnicity, material hardship, and parental and child emotional health. Latinx ethnicity is used as a starting point that is linked to material hardship, which is then connected to maternal and child emotional health and/or neurophysiology (stress biomarkers).

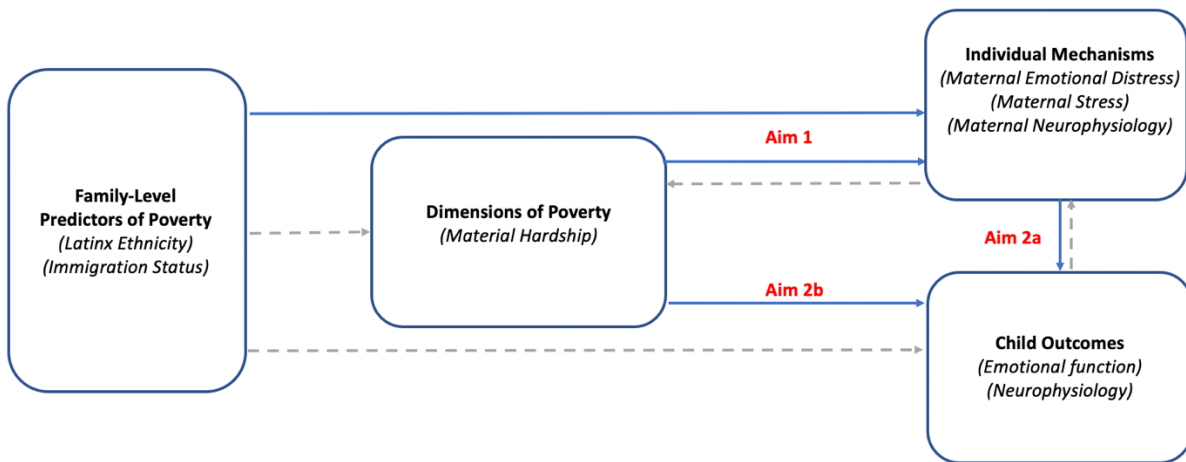
Research Aims

The specific aims of this research are to analyze survey and biomarker data from low-income Latinx mother and child participants of a previous randomized trial to test associations between:

- material hardship, acculturation, and maternal emotional symptoms or stress (*Aim 1*);
- maternal stress and child emotional function and stress (*Aim 2a*); and
- material hardship and child emotional function and stress (*Aim 2b*).

Our study sought to contribute to emerging scientific evidence that material hardship and acculturation are associated with maternal emotional problems or stress (*Aim 1*) and that maternal stress (*Aim 2a*) and material hardship (*Aim 2b*) independently influence child emotional health. This work helps to fill outstanding gaps in the knowledge base around these topics specifically for Latinx mothers and their children. Our findings also contribute to the limited research on the use of hair cortisol to measure the physiologic impacts of stress and hardship in Latinx populations. We anticipate that study findings can inform clinical practice and policy related to social and/or mental health supports that can contribute to improving health outcomes in Latinx mothers and children.

Figure 1.



*Adapted from "Conceptual Framework for Effects of Poverty on Child and Youth Mental, Emotional, and Behavioral Health", by Yoshikawa, H., Aber, J. L., & Beardslee, W. R. (2012).

--- Relationship supported in the literature but not tested in this study

IV. Review of the Literature

Child Emotional Health

The influence of emotional function—defined as one’s ability to express feelings about oneself, others and situations and to establish, change or maintain regulation in one’s environment³⁵—in childhood is extensive and impacts well-being into adulthood.⁸ Distinct from behavioral function, symptoms specific to emotional function are generally referred to as “internalized”, such as self-esteem, mood disturbance, worry or other feelings experienced within the individual.^{1,36} The term “emotional health” is sometimes used interchangeably with “mental health”, although mental health generally represents a broader area of health that includes emotional, developmental and behavioral function.¹ For the purpose of this review, “emotional” health or function will be used to refer specifically to emotional and internalizing symptoms or conditions. Emotional disorders that affect children are mood (e.g. depression, bipolar disorder) and anxiety disorders (e.g. phobia, panic).^{1,37}

Emotional dysfunction can lead to both psychological and physiologic symptoms. Perhaps the most classic notion of the physiologic reaction to stress is known as the primitive “fight or flight” response, in which individuals experience physical changes to prepare the body for coping with an immediate threat, such as that of being hunted by a predator. Activation of the hypothalamic-pituitary-adrenocortical (HPA) axis and the sympathetic-adrenomedullary system releases hormones such as adrenaline and noradrenaline, cortisol, corticotropin-releasing hormone (CRH) and epinephrine and norepinephrine.³⁸ These hormones stimulate the sympathetic nervous system to enhance the cardiopulmonary, metabolic, neuromuscular and other system functions that allow an individual to escape or attack in response to threat. Simultaneously, the immune system responds through inflammatory pathways and the release of

cytokines which prepare the body to heal and recover from potential injury. Together with the parasympathetic nervous system which downregulates the above processes, all of these functions contribute to allostasis, the process by which the body adapts in response to stress in an attempt to return to homeostasis or stability.³⁹ In the short-term allostasis is thought to be a protective process, but persistent activation of the stress response leads to an increased allostatic load which can have pathophysiologic consequences contributing to chronic disease.^{21,38-40}

Significance and Outcomes of Child Emotional Dysfunction

Poor emotional health can impact children's development in multiple domains and interfere with daily functioning across all racial and ethnic groups.^{1,15}

Physical health. Emotional dysregulation may contribute to illness and physical health in children through changes to brain structure, function and neurochemistry.^{10,21,41} Hypertrophy of the amygdala can result from persistent activation of the emotional response, and leads to an even lower threshold for stressors that cause anxiety and fear.²¹ Elevated levels of cortisol that occur during persistent emotional distress can negatively impact the function of the hippocampus and pre-frontal cortex, leading to long-term consequences for learning and mood regulation.^{10,21,42} Emotional disorders such as depression are a major risk factor for suicide, which is the second leading cause of death in youth 5 to 24 years old.⁴³ Poor emotional health in children is also associated with difficulty falling or staying asleep, which in turn has negative consequences for physical and mental health.^{1,44}

Development. Many of the previously described neurochemical and structural alterations to the brain that occur during chronic stress or emotional disorders also impact child development.^{10,21,42} The amygdala, hippocampus and prefrontal cortex control executive function, learning, memory, and mood regulation, and thus alterations to the architecture of these

areas in the brain can impact cognitive, emotional and behavioral development.^{10,21,41,42} It is not surprising then that emotional disorders have been associated with grade repetition, delinquency and other adverse academic outcomes in school-aged children.^{12,45} Language development has also been associated with emotional regulation, and children with poor language ability are found to be more prone to growth in dysregulation over time.⁸

Interpersonal relationships. Emotional dysfunction can impact the quality of a child's relationships with family or peers.^{1,46-48} Interpersonal interactions can be challenging for children with anxiety, who have difficulty expressing and understanding emotions and may use less effective coping strategies such as avoidance.⁴⁶⁻⁴⁸ Youth who suffer from depression may struggle to sustain stable relationships with family, peers and romantic partners.¹²

Economics. Based on data collected for the Medical Expenditure Survey, between 2009-2011 an average of over 9% of children ages 5-17 years had health care expenses related to mental health.⁴⁹ At almost \$11 billion annually, the costs associated with emotional and behavioral health conditions for children are higher than costs for any other child health disorder.^{15,49} Financial impact from child emotional dysfunction may include the expenses incurred related to therapy, medication or other treatments, as well as impact to school attendance and parent work productivity.⁴⁹ The later economic consequences of impaired learning and school failure described earlier are difficult to quantify but must also be considered in their impact on future workforce.²¹

Adult health issues. Disorders of emotion and behavior in childhood are also more likely to predict mental health issues in adulthood, which are associated with higher rates of substance abuse, homelessness and incarceration.^{1,8,50} Emotional dysregulation in childhood also predicts lower educational attainment and employment difficulties in adulthood.^{8,12,37} Depression in

adults is specifically associated with other psychiatric disorders, substance use disorders, suicidality and poor quality of life.¹³ Anxiety in adults is associated with physical disorders such as gastrointestinal, respiratory and cardiovascular disease as well as other psychiatric disorders, substance use and poor quality of life.¹⁴

Prevalence and Disparities in Child Emotional Health

In 2016, an estimated 3.2% of all children in the United States had a current diagnosis of depression,¹⁵ steadily increasing from 2.5% in 2007 and 2.7% in 2012.⁵¹ About 7.1% had a current anxiety diagnosis,¹⁵ up from 3.5% in 2007 and 4.1% in 2012.⁵¹ The exact reasons for this increase are not known. Possible explanations include an actual change in prevalence, versus just an increase in diagnosis related to improvements in screening or alterations in the public perception of mental health concerns that allow for more people to seek help without the fear of stigma.³⁷ Among children living below the federal poverty level, current depression rates are higher at 4.8%, and anxiety is also higher at 7.6%.¹⁵ The true prevalence of these conditions in families with low socioeconomic status is predicted to be even higher, however, given that many children with mental health conditions go undiagnosed and face numerous barriers to mental health services such as lack of insurance and access.^{1,23,25,52}

Rates of current *diagnosed* depression and anxiety specifically among Latinx youth are lower than in youth from other racial and ethnic groups (2.2% and 6% respectively),¹⁵ and these findings are consistent across multiple studies.^{23,50,53} However, it is suggested that these studies are likely identifying a lack of diagnosis rather than lower prevalence.^{15,23,25,29,50,52} In studies that measure symptoms rather than diagnoses, Latinx youth are actually more likely to screen positively for depressive symptoms^{36,54,55} and anxiety symptoms^{26,56} than their non-Latinx counterparts. For example according to the 2017 Youth Risk Behavior Survey, almost 34% of

Latinx adolescents reported feeling sad or hopeless, the highest rate compared with White or Black youth (30% and 29%, respectively).⁵⁷ Even after diagnosis, children living below the federal poverty level and Latinx youth are also *less* likely to receive treatment for emotional concerns than children from higher income or non-Latinx households.^{15,25,50,58,59}

Predictors of Child Emotional Health

There are multiple factors that predict emotional health in children that extend from children's physiology to their environment.¹

Genetics and epigenetics. Familial physiologic predictors include genetic transmission, and twin studies suggest that there is heritability of 40 to 50% for depression⁶⁰ and 30 to 40% for anxiety disorders.^{61,62} The inheritance pattern for depression is not clear, and research related to its genetic basis is still in its early stages.⁶³ Similarly, while some potential genetic markers for anxiety disorders have been identified, there is still much to be learned in this area.⁶²

Intergenerational transmission of distress may also be related to epigenetics, a process by which gene expression in offspring is altered without changing the DNA sequence.^{21,64,65} Studies have shown epigenetic markers present in genes related to the stress response across multiple generations in families exposed to poverty or other adversity, suggesting that elements of emotional distress related to disadvantage may be heritable as well.^{64,66} The underlying scientific consensus is that one's ecological context can modify genotype expression.^{21,65}

Age and Sex. In addition to ethnicity, there are other sociodemographic characteristics associated with emotional dysfunction in childhood. The prevalence of depression increases with age,^{1,15,36,67,68} from 1.7% during school age to 6.1% in adolescence.¹⁵ Anxiety shows similar patterns,^{1,15,36} with a rate of 6.6% in school age versus 10.5% in adolescence.¹⁵ Part of the increase in prevalence of emotional disorders in adolescence is attributed to stress from peer

relationships, as there is greater risk for peer victimization and relationship instability during this period.⁶⁷

Both conditions are also more common in females than males.^{1,15,37,54,67-70} The underlying etiology of sex differences in emotional disorders is not well understood, but one theory has to do with the potential relationship of hormonal differences between males and females, which also supports the increase in prevalence among adolescents, when hormonal changes of puberty occur.^{68,70,71} Sex-linked genetic markers for depression and anxiety have also been investigated, and may be related to individual susceptibility to these disorders that is triggered by increases in interpersonal stress during adolescence.^{67,71} There is also some evidence that girls and women have heightened emotional responses to interpersonal stressors as compared to boys and men, suggesting that gender may also be a predictor for emotional dysfunction.^{67,68,70-72}

Temperament. Personality and temperament may predispose children to emotional dysfunction.^{73,74} For example there is some evidence that suggests that children with a withdrawn temperament are more vulnerable to emotional disorders.^{48,75} Negative emotionality, or the tendency to experience negative emotions or mood, has been associated with anxiety^{48,73} and depression^{73,74,76} in children. Temperamental resistance to control may also predict emotional dysregulation later in life.⁸

Physical. The co-existence of chronic illnesses puts children at risk for emotional disorders,⁷⁷ either due to persistent illness-related stress or to neurobiological alterations that are a result of the illnesses or their associated treatments.⁷⁸ Chronic illnesses such as diabetes, asthma and cancer have been linked to depression and anxiety in children, and psychological impairment may persist into adulthood.⁷⁹ Malnutrition in childhood can also lead to harmful

alterations in gene expression, brain plasticity and other neural processes that contribute to emotional and behavioral problems.¹⁰

Discrimination and acculturation. Multiple studies show that Latinx immigrant adolescents showed higher rates of emotional impairment over non-immigrants, with discrimination and acculturation stress as the primary presumed mechanisms for these outcomes.^{32,55} Acculturation stress refers to the pressures associated with balancing one's native and new cultural context, such as learning a new language or traditions while maintaining original ones.^{75,80,81} The degree to which the native and host cultures differ as well as the extent to which an individual desires to assimilate to the host culture are factors that may influence the magnitude of acculturation stress.⁷⁵ Language is often used as a measure of acculturation, and greater English proficiency has been found to be inversely related with acculturation stress among Latinx immigrants in the U.S.⁸¹

Perceived discrimination is associated with an increase in internalizing symptoms for Latinx youth,^{26,82} as is acculturation stress,^{26,56} regardless of birthplace. For U.S.-born Latinx youth or those who immigrated as young children, emotional dysfunction may stem from difficulty reconciling experiences of discrimination after having become acculturated and not perceiving themselves as “foreign”.^{82,83} Parent cultural stress also negatively impacts the emotional well-being of Latinx youth,^{75,80,84} and will be discussed later in this review.

Adverse childhood experiences. Adverse childhood experiences (ACEs) include exposure to a number of types of abuse or household dysfunction during childhood, and have been tied to poor mental health, cardiometabolic disease, and other negative social outcomes in adulthood.^{40,85-87} Conventional ACEs include abuse (emotional, physical, or sexual) or neglect by someone in the household, substance abuse or mental illness in the household, parental

separation or divorce, and incarceration of a household member.⁸⁵ Expanded, or community-level, stressors have since been added to the list of ACEs to include community violence, peer victimization, crowding and noise, and perceived racism.^{86,88,89} Studies including expanded and conventional ACEs have been thought to include many of the stressors faced by racially and ethnically diverse and younger populations, in contrast with the predominantly White adult sample used in the original ACEs study.^{86,88,89} In 2016, almost half of all children in the U.S. reported at least one ACE, and over 21% reported two or more.⁹⁰ Latinx children were the highest non-White group to report at least one ACE, at 27%.⁹⁰ In a study of Latinx families in the U.S., 29% of all children reported at least one ACE, with slightly higher reports in immigrant (31%) vs. U.S.-born (26%) children although this difference was not statistically significant.⁹¹

Whereas much of the research focuses on the impact of ACEs on disease burden in adults,^{40,85-87,89} more recent evidence demonstrates that the health consequences of ACEs exist in childhood as well.^{88,92-94} As discussed earlier, persistent exposure to such issues is thought to result in “toxic stress”, or prolonged activation of the stress response without a buffer, which leads to many of morbidities associated with ACEs.^{10,21} ACEs have been tied to childhood physical and emotional health outcomes in multiple studies, and generally the burden of outcome increases with the number of ACEs experienced.^{77,88,92-95} Child emotional disorders associated with ACEs include depression, anxiety, and general psychological distress.^{88,90,94}

Socioeconomic. Other environmental predictors of emotional dysfunction in children include poverty status, lack of community support, and inadequate access to healthcare.^{15,96-98} Low school support increases the risk for depression among Latinx adolescents.⁵⁴ Chronic exposure to poverty is associated with poor mental health in children.^{36,99} More on the impact of material hardship and poverty on child emotional health will be discussed later in this review.

Maternal mental health. Perhaps one of the most significant environmental predictors of child emotional health is parental mental health, especially that of the child's mother.^{2-7,84,100} Poor maternal mental health may negatively impact secure attachment and bonding, lead to harsh or negative discipline, or otherwise impede supportive caregiving.^{5,6,8-11} This adversely affects child emotional health by either exposing the child to, or failing to protect the child from, chronic stress in the environment.^{5,7,21,38} Specifically in Latinx mothers, poor maternal mental health is related to poor physical and emotional health in their children.^{4,9,23,24,84,100}

“Familismo” is the concept of strong family ties and values that is central to most Latinx cultures,^{82,101} and is thought to serve as a buffer against many risk factors that can contribute to physical or mental health problems in this population.^{26,33,82,83,102} Familismo is inversely associated with internalizing symptoms in Latinx youth, suggesting that strong family relationships are protective against emotional dysfunction.^{26,55,82} Family and peer relationships are also found to mediate the association between maternal psychological distress and internalizing problems in Latinx youth.¹⁰³ The following section will further explore maternal emotional health and its impact on child emotional health.

Maternal Emotional Health

Negative emotional health outcomes in Latinx mothers have been related to poor physical and emotional health in their children.^{4,9,23,24} Emotional dysfunction experienced by Latinx women includes depression, anxiety, or stress.¹⁰⁴ The response to stress is both physiologic and psychological, and its effects can range from positive to toxic depending on the chronicity of stress exposure.²¹

Emotional symptoms of stress include irritability or anger, nervousness or panic, worry, inattention, frustration, mood swings, guilt, overwhelm, and sadness,¹⁰⁵ and the persistent

experience of these symptoms by mothers may negatively impact the emotional health of their children.^{22,103,106,107}

Parenting stress refers to the difficulty experienced when the demands of childrearing are thought to outweigh the support available to provide such care.¹⁰⁸ A wide body of research demonstrates that parental stress can contribute to impaired parent/child bonding or inability to provide adequate caregiving support.⁸⁻¹¹ Poverty and material hardship have also been associated with elevated parenting stress^{18,27,99,109-111} and will be addressed in further detail later.

Adult immigrants may also experience additional stressors related to acculturation and/or perceived discrimination. A number of studies have demonstrated that discrimination, or perceived unfair treatment or negative attitudes towards members of a group, is tied to increased acculturation stress and psychopathology in Latinx individuals.^{75,80-82,100,112,113}

Significance and Outcomes of Maternal Stress

Stress has been linked to numerous physical and mental health conditions in adults, including depression, cardiovascular disease, and gastrointestinal or neurological disorders.¹⁰⁵ Depression and anxiety in adults are associated with other psychiatric disorders, chronic physical health conditions, substance use disorders, suicidality, and poor quality of life.^{13,14} Maternal stress can also impact child emotional health, through physical, emotional, or interpersonal pathways.¹¹⁴

Health status. Alterations in the immune and inflammatory response have been associated with poor health outcomes such as cardiovascular disease, asthma, and autoimmune diseases in adults.^{21,40} Stress is associated with depression in adults,^{21,80,111} and higher levels of anxiety in their children.⁷⁵ Caregivers who rate their own mental health as fair or poor have

children with double the prevalence rates of depression and anxiety, compared to those whose caregivers who do not report poor mental health.¹⁵

Interpersonal relationships. Psychological distress in mothers and fathers increases interparental conflict and negative parenting behaviors, which is in turn associated with greater internalizing behaviors among their children.^{11,114} Families under financial strain experience greater stress and child-caregiver conflict, which is also associated with decreased child emotional function.^{110,114} Latinx parents who experience acculturative stress show greater degrees of emotional distress and disruption to parenting or other family relationships.⁸⁰ In multiple studies of Latinx families, strength of the parent-youth relationship has been shown to act as a buffer between the effects of parental stress on child emotional problems—supporting the concept of familismo discussed earlier in this chapter.^{27,80,82,103,114,115}

Prenatal. Even during the preconception period, maternal stress may alter the placental environment, causing increased concentrations of hormones that impact fetal brain development; this is also referred to as “fetal programming”.^{64,65} Multiple studies support the evidence that a child’s stress response and emotional reactivity may be impacted by exposure to maternal stress as a fetus.^{21,65,84,116,117} The pathway for these neurodevelopmental changes in the fetus is in part thought to be closely related to epigenetics,^{10,64,65} as explained in the previous section.

Prevalence and Disparities in Maternal Emotional Health

According to recent U.S. census data, an estimated 9% of Latinx adults reported regular feelings of anxiety and 4% reported regular feelings of depression.¹¹⁸ In a recent survey, Latinx respondents reported an average stress level of 6.1 out of 10 (with 10 meaning “a great deal of stress”), compared with Whites who report an average of 5.3 out of 10.¹¹⁹ In the same survey, 43% of Latinx respondents reported that discrimination was a significant source of stress, as

compared to only 25% of White adults.¹¹⁹ In another survey, individuals in poor health or with low income were more likely to report having a great deal of stress.¹²⁰ Parenting is reported as a source of stress for some, with 9% of adults reporting that problems with children are the most stressful experience for them. Over a third of parents of teens and single parents say they experienced a great deal of stress in the last month.¹²⁰

Predictors of Maternal Emotional Dysfunction

Mothers may face stressors related to personal characteristics, life experiences or environmental exposures, among others.

Maternal health and support. Mothers in poor physical health are at higher risk for depression and parenting stress.^{108,111} Having a partner or social support reduces parenting stress for mothers.^{108,111,121,122} Better partner mental health may also buffer the influence of maternal mental health on child emotional function.^{2,117} Latinx women in the U.S. experience high rates of emotional disorders such as depression or anxiety.^{104,123-126} Latinx parents who report high levels of familismo show lower rates of depression⁸² and stress^{33,55}, suggesting that social support may be protective against their emotional dysfunction.

Socioeconomics. Mothers who experience economic hardship are at higher risk for depression^{3,4,82,100,111,127} and parenting stress,^{110,111,117,128} which contributes to child emotional dysfunction.^{4,20,100,110} Parental coping mechanisms and responses to stress are thought to mediate this pathway between hardship and child stress or emotional health.²⁰ Low-income parents who report material hardship are more likely to report psychological distress than those without hardship.¹²⁹ Material hardship is also found to mediate the relationship between income poverty and parenting stress, which supports the notion that parents with material needs may experience stress even at an income above the poverty level.¹⁸ Among Latinx adults, perceived

discrimination is associated with heightened acculturative stress leading to increased psychological distress^{81,112,113} which in turn negatively impacts their children's internalizing behaviors.^{75,100,112,113}

Measures of Emotional Health

Disparities exist in diagnosis rates of emotional disorders in Latinx youth and adults, and as mentioned previously, research that relies on reports or documentation of diagnoses as the unit of measurement may result in an underestimation of the true burden of dysfunction in this population. Studies that measure the presence of internalizing symptoms or physiologic signs, rather than diagnoses, may therefore better capture the prevalence of emotional dysfunction in this population.

Surveys. Several validated survey-based screening tools are used in research to evaluate for symptoms of emotional dysfunction in both youth and adults, but measures that are based on self-report may be limited by various biases. Social desirability bias refers to participants' tendency to provide responses that they consider to be more favorable or acceptable according to their own cultural or societal norms, and has been proposed as a concern in studies related to emotional health in Latinx populations due to stigma around this topic.^{29,130} When analyzing survey data, the possibility that underreporting and bias may impact results (likely underestimating effects) must be considered. It is also imperative that the survey tools used in research have been validated in Latinx populations, to account for cultural variations in the interpretation of questions that may influence the accuracy of results.^{25,29,56}

Biomarkers. Another way to measure emotional impairment is through physiologic signs. The use of "biomarkers" as physiologic measures of emotional dysfunction is based on evidence that chronic stress exposure activates certain inflammatory and hormonal processes at a

persistent and eventually harmful level, and in some cases causes alterations in genetic expression or brain structure and function.^{1,21,38,41,42,64,131-134} Cortisol is a glucocorticoid responsible for some of the regulation of the hormonal stress response.^{38,135,136} Cortisol deposits into hair through the vasculature of the hair follicle, sebaceous gland secretions or other exogenous sources and its concentration is thought to be stable in hair for up to approximately 6 cm of growth.¹³⁶⁻¹³⁸ With the slow rate of hair growth (about 1 cm per month), this means that hair cortisol concentration provides a better measure for chronic stress over several months.¹³⁶⁻¹³⁸

Studies have found elevated cortisol levels in children to correlate with poverty,^{22,117,139-144} and food insecurity,¹⁴⁵ supporting the hypothesis that the experience of economic hardship stimulates the physiologic stress response. Child cortisol levels are also correlated with anxiety or depression symptoms,^{136,146,147} and with maternal stress,¹⁴⁸⁻¹⁵⁴ as well as reports of racial discrimination.¹⁵⁵ Elevated hair cortisol concentration in adults has been associated with mental health disorders,¹⁵⁶ trauma and adversity,^{135,157} economic hardship,¹⁵⁸ and racial discrimination.^{155,159}

The benefit of using biomarkers in emotion research is that they may provide a more objective measure of the presence of distress and are not vulnerable to the response biases we see in survey research. However, there is still much to learn about the analysis and understanding of biomarkers as a measure of stress or emotion, particularly in the pediatric population,^{38,138,142} and therefore research in this area is still interpreted with caution.

Influence of Latinx Ethnicity and Culture

Disparities in diagnosis and treatment of emotional disorders in disadvantaged Latinx populations may be explained in part by cultural or personal beliefs about mental health and its related stigma.^{25,29,56,130,160-162} Latinx parents may not seek medical attention for their children's

emotional dysfunction due to cultural beliefs around the legitimacy of mental health diagnoses in youth, and/or the necessity of treatment outside the home or family unit.^{130,160-163} They may also be hesitant to report mental health symptoms in their children due to cultural assumptions that the dysfunction is related to problems with their parenting.^{101,163} Religion may play a role, and Latinx parents may see emotional dysfunction as a spiritual issue and seek support from clergy or others in their faith community rather than a health care professional.^{101,130} Latinx parents may also be concerned about privacy, and the risk that others in their community would find out about their child's emotional disorders if shared with their health care provider.¹⁶⁰ In addition, research in Latinx populations around emotional disorders may be skewed if these cultural beliefs impact their willingness to participate in mental health research, and/or their responses to surveys about their child's emotional symptoms.²⁹ As discussed previously, survey data is vulnerable to response bias, particularly in Latinx populations around sensitive topics such as mental health, and results must be interpreted with caution.²⁹

“Hispanic health paradox” hypothesis. An alternative theory to explain why some studies show lower rates of emotional disorder diagnoses and treatment in the Latinx populations is the “Hispanic health paradox” or “healthy immigrant paradox”. According to this idea, less acculturated Latinx immigrants experience genetic, lifestyle, or cultural protective factors over their U.S. born or more acculturated Latinx counterparts, that contribute to better health outcomes.³⁰⁻³³ The benefits of healthy lifestyle habits or social support decrease as immigrants spend a longer time in the host country and presumably become more acculturated. At the same time, there is an increase in the negative health impacts of stress arising from discrimination, as immigrants attempt to become more assimilated in their environment.^{33,82,164}

A number of studies in adult Latinx populations have shown better physical and mental health outcomes in recent immigrants over those who are native-born,^{100,165-167} yet others have shown no statistically significant support for the paradox.^{168,169} The paradox theory has been criticized for relying on methodology that either favors healthier research participants or consists of flawed under-reporting in morbidity and mortality data.^{31,32,168} One argument, sometimes known as the “salmon bias”, is that only the healthiest individuals tend to migrate and stay in the host country after immigration, and thus research on immigrants tends to be selective towards a healthier and more resilient population.^{32,168} Another criticism proposes that immigrants are not well accounted for in census and other population data sources and thus the prevalence of illness or death of immigrants is underestimated.^{31,32}

In studies of Latinx youth, the immigrant health advantage has not been well-established, presumably because children have had a shorter time to accumulate the benefits of lifestyle and culture from their native country and are likely to acculturate sooner.^{31,32,55} In a recent meta-analysis, Latinx immigrant children and adolescents were actually found to have a greater risk of mortality over their host country native counterparts.³¹ Other studies have shown Latinx immigrant youth to be more vulnerable to food insecurity and lack of insurance or healthcare access^{91,164} which can contribute to poor health outcomes. Even studies showing more positive birth outcomes for immigrant Latinx mothers found that the paradoxical benefits for their children did not extend into childhood.^{170,171}

Material Hardship

Material hardship refers to the difficulty people have in their ability to meet their basic physical needs of housing, food, medical care, and other essential elements of safe and healthy living.¹⁷ It is considered to be a more specific and multidimensional way to look at poverty and

its impact on well-being, as compared to traditional broad measures of household income or education level.^{3,18,19,127,172,173} Multiple studies demonstrate that families may experience persistent material hardship even if they only endure short-term or transient episodes of income poverty,^{3,18,173-175} and therefore it is essential to better understand its associated outcomes and predictors.

Significance and Outcomes of Material Hardship

There is evidence that exposure to material hardship can negatively impact the health and development of children and their mothers.^{18,84,128}

Development. Material hardship is negatively associated with the development of child cognitive and socio-emotional skills.^{18,22,128,174,176} As previously discussed, neurochemical and structural alterations to the brain that occur during chronic stress impact child development, and poverty or economic hardship has been identified as a key source of stress in this relationship.^{21,42,128} Exposure to material hardship can also impact child development through lack of exposure to experiences that foster developmental advancement (e.g. habitability concerns that prevent an infant from having opportunities to crawl or walk), or limited support systems (e.g. poor access to health care or limited parent availability due to employment needs).^{18,128,176,177}

Physical and emotional health. Material hardship is associated with poor physical health status in children.^{3,109,174,178-181} Proposed explanations for these associations include limited access to proper nourishment or protection from exposures,^{174,178} the physiologic impact of chronic stress,^{22,128} impaired access to medical care,¹⁸¹ and negative impact on parents' physical or mental health.^{23,174,178,181,182} Childhood disadvantage is also associated with an increased risk for depression and chronic pain in adulthood.¹⁸³

Increased presence of internalizing and externalizing behaviors is also reported in children of families experiencing economic and material hardship.^{3,20,22,110,177,182,184,185} Children from families with income below the federal poverty level have higher rates of depression and anxiety than those above the poverty line.^{1,22,37} Many studies have shown that material hardship mediates the relationship between income poverty and child emotional health, indicating that the presence of poverty alone is not enough to explain the effects on emotion, although the reasons why are not well understood.^{18,22,178}

Parental distress. Material hardship may also impact child mental health through effects on parents.^{18,20,82,84,110,111,115,128,182,185} For example, parental distress related to unemployment or debt is found to negatively impact their children's emotional health.^{115,182} Food insecurity is independently associated with serious psychological distress in low-income parents^{129,185,186} and Latinx populations.¹⁸⁷ Economic hardship is associated with an increased risk for depression in adults,^{3,122,127,174,178,183} particularly Latinx parents.^{82,111,124} More on the impact of parental mental health on children's emotional health was discussed in the previous section of this review.

Prevalence and Disparities in Poverty and Material Hardship

According to recent data, the rate of average annual household poverty in the United States is estimated at just over 10%.¹⁸⁸ Regardless of income level, over 39% of all adults in the U.S. report having any material hardship, with 23% reporting food hardship and 18% reporting difficulty paying their rent or mortgage or family medical bills.¹⁷⁵ Among low-income individuals the rates of hardship increase significantly, as over 60% of adults living below 200% of the federal poverty level report any hardship, including over 40% reporting food insecurity and 30% having difficulty paying family medical bills.¹⁷⁵ The rate of families with children living below 200% of the federal poverty level is estimated at 35%.¹⁸⁸ Low-income parents are

more likely to report any material hardship than low-income adults without children (69% vs. 60%, respectively), including more food hardship (52% vs. 40%) and housing hardship (28% vs. 14%).¹²⁹

The rate of average annual poverty among Latinx households in the U.S., at just over 15%, is significantly higher as compared to White, non-Latinx households at just over 7%.¹⁸⁸ Latinxs are overrepresented in poverty rates, accounting for 28% of the U.S. population in poverty even though they represent only 18% of the general population, as compared to the White, non-Latinx population (41% and 60%, respectively).¹⁸⁸ Over 50% of Latinx households report having any material hardship, as compared to 34% of White, non-Latinx households, regardless of income poverty level.¹⁷⁵ Among families with children, 25% of Latinx families are impoverished as compared to 11% of White, non-Latinx families, and proportionally more Latinx children live in a low-income household than White, non-Latinx children (54% vs. 27%, respectively).¹⁸⁹

Measures of Material Hardship

Multiple survey tools exist to measure individual material hardships.^{184,190,191} Some studies have measured the impact of cumulative risks rather than, or in addition to, single stress exposures.^{3,19,22,109,111,180} Risks may be calculated as simply a sum of affirmative reports to the presence of a stressor,^{3,19,109,111,180} or number of exposures rated to be positive on whatever individual stressor measurement scales were used in the study.^{22,174} While cumulative scores are a way to demonstrate a level of overall material hardship, the aggregation of measures across dimensions (i.e. housing, food, etc) is thought to have less face validity than individual measures or aggregations within dimensions; therefore, experts recommend analyzing both individual and composite measures as a more valid and comprehensive approach.^{17,178} It is important to mention

that surveys related to income and hardship have received scrutiny related to their accuracy in recent years, due to response biases and misreporting related to the stigma of receiving public benefits,¹⁹² and therefore it is possible that the data reported above may actually underestimate the true prevalence of material hardship.

Predictors of Material Hardship

Evidence suggests that family health status predicts material hardship among U.S. populations. Among families living below the federal poverty level, parental health problems and psychological distress are strong predictors of material hardship.¹²⁹ While material hardship is demonstrated to be a problem for families even without co-existing poverty, the presence of income poverty does predict higher levels of material disadvantage.^{18,19,22,128,129,173} Latinx ethnicity has been associated with higher levels of material disadvantage, even without the presence of poverty.^{19,175} Nativity may also predict hardship, as immigrant mothers report significantly more material hardship than those born in the U.S.¹⁷⁴

Summary and Synthesis

Relevant literature presented in this chapter demonstrates that Latinx mothers may face significant stress associated with parenting, economic hardship, racial discrimination, or acculturation, and all these stressors may in turn negatively impact the emotional health of their children.

Many of the existing studies on emotional health in children and mothers are population-based and consist of large nationally representative samples, increasing the generalizability of findings to diverse populations in the United States. However, heterogeneity among Latinx subgroups is likely diluted in such studies. The nature of such large studies generally leads to a reliance on survey data (most often by interview but sometimes self-administered), which can be

limited by potential bias from the willingness or ability of participants to respond to the surveys accurately or variability in measurement tools used to collect data. Studies focused on Latinx samples also more often have smaller and more regional samples, which may be in part related to the challenges in subject recruitment in this population presented earlier in this review. These smaller and more localized sample sizes may limit the generalizability of results to wider populations. However, the use of smaller samples allows for greater feasibility of longitudinal study designs, in contrast with the cross-sectional methods used in most population-based studies, increasing the validity of results that remain consistent over time.

Research on the impact of poverty on emotional health is abundant, but the body of knowledge related specifically to material hardship is more limited, particularly in Latinx populations. Even though material hardship is independently associated with child and parental emotional health, very few studies have investigated both outcomes together. Few studies also examine relationships with both summative and independent forms of hardship, which could provide a more multi-dimensional view that may be more informative when considering how to ultimately address the impact of hardship on Latinx children and mothers. Given the previous discussion of the potential for response bias that exists with survey research related to mental health and economic factors, particularly in Latinx populations, the use of physiologic measures may provide a more robust examination of stress and emotional health that is missing from survey-based research. Still, the investigation of stress biomarkers such as hair cortisol in Latinx mothers and children, and especially how they relate to material hardship, is sparse.

The findings from this dissertation research address some of these identified gaps in the literature. Our use of a larger California urban community-based sample of Latinx mothers and children from 0 to 17 years of age improves our understanding of emotional dysfunction and

material hardship in low-income Latinx families. The use of hair cortisol as a biomarker for physiologic stress in addition to survey measures of maternal stress and child emotional function provides a more holistic view of stress outcomes in Latinx mothers and children. Finally, an assessment of both individual as well as total level of social needs provides a more comprehensive view of material hardship and how it relates to emotional health in Latinx mothers and their children.

V. Study Part One

Social Needs and Acculturation as Predictors of Emotional Problems and Perceived

Stress Among Urban Low-Income Latinx Mothers

Latinx women in the U.S. experience high rates of emotional disorders such as depression or anxiety.^{104,123-126} These conditions contribute to other adult psychiatric disorders, chronic physical health conditions, substance use disorders, suicidality, and poor quality of life.^{13,14} In addition, poor emotional health in Latinx mothers is associated with poor physical and emotional health in their children^{4,9,23,24} that could have harmful consequences into later life.⁸

Higher levels of acculturation in immigrant or U.S.-born Latinx populations have been associated with worse mental health outcomes, including depression and anxiety.^{104,123,126,193} One theory used to explain this is the “Hispanic health paradox”, which posits that cultural factors rooted in the country of origin help to buffer the impact of U.S. societal factors that negatively influence health outcomes.^{30-33,126} For example, “familismo” is a central value in many Latinx cultures, emphasizing the importance of family loyalty and bonding, and may help to diminish the impacts of physical or mental health stressors.^{33,82,101,104} With acculturation, these country of origin cultural factors and their protective effects may be lost. In parallel, researchers have documented an increase in the negative health impacts stemming from discrimination experiences that accrue as immigrants integrate into their new environments.^{33,82,126,164,194} These experiences exacerbate stress for parents who moved to a new country and then face multiple new stressors related to their own and their children’s immigration status.^{80,82}

In addition to acculturation, income poverty has been shown to be an important predictor of mental health outcomes for low-income populations in the U.S., generally, and for Latinx women, more specifically.^{104,111,195,196} More recent literature has underscored that material

hardship—disadvantage related to social needs such as food or housing¹⁹⁷ is closely tied to health outcomes.^{19,127,172,198,199} Several studies have linked select social needs specifically to negative emotional health outcomes in low-income parents,^{124,127,172,198,199} though these are primarily large population studies that lack the ability to explore variation in ethnic subgroups, including the potential influence of cultural concepts of distress²⁰⁰ or social desirability bias.²⁹

Aims and Hypotheses

In this analysis, our primary aim was to explore associations between categorical level of and individual household social needs, acculturation, and self-reported emotional problems and perceived stress in a population of low-income Latinx mothers. Our hypothesis was that reports of more household social needs would predict greater emotional problems and perceived stress in mothers, especially among more acculturated subjects, even after controlling for sociodemographic characteristics. Our secondary aim was to explore whether specific social needs were associated with maternal emotional problems or perceived stress.

Materials and Methods

Study Design, Setting, and Sample

We performed a secondary analysis of cross-sectional survey data obtained at the time of enrollment in a randomized clinical trial (RCT) of over 600 children and their caregivers in the pediatric urgent care health center of a public hospital in San Francisco, California. The RCT took place between July 2016 and June 2018; details of the RCT's recruitment process and eligibility criteria are published elsewhere.²⁰¹ We limited the sample in this analysis to caregivers who identified themselves as mothers (n=549) and of “Hispanic or Latino origin or descent” (n=455).

Protection of Human Subjects

The Committee for the Protection of Human Subjects at the University of California, Davis approved the study as exempt from full review because we used only de-identified data in these analyses.

Study Measures and Variables

The mother was the unit of analysis for this study. At the time of enrollment in the RCT, mothers completed surveys (in English or Spanish) about themselves and their children, including questions about their demographic characteristics, social situation and needs, and their physical and mental health.

Outcome variables. Two primary outcomes were examined: 1) emotional problems; and 2) perception of stress.

The Patient-Reported Outcomes Measurement Information System 10-item Global Health scale (PROMIS Global®)²⁰² has been shown to be reliable and valid for the assessment of physical and mental health in diverse^{203,204} and Spanish-speaking²⁰³ populations. Mothers' reports of emotional problems were measured using responses to a single item from the PROMIS Global Mental Health sub-scale: "In the past 7 days, how often have you been bothered by emotional problems such as feeling anxious, depressed or irritable?" Answers are provided using a 5-point Likert scale from 0 (never) to 4 (always) (recoded for analysis into three groups as never/rarely=reference, sometimes, often/always).

Maternal perceived stress was measured with the PSS-4, a shortened version of the full Perceived Stress Scale instrument,²⁰⁵ that measures adults' perceived stress in their ability to control or handle life events occurring in the past month.²⁰⁶ The four items are scored on a five-point Likert scale ranging from 0 (never) to 4 (very often), where higher scores reflect higher perceived stress.²⁰⁶ The PSS-4 tool is shown to be reliable and valid in English-speaking²⁰⁶ and

Spanish-speaking²⁰⁷ participants. Because there are no formal cutoffs for scores on the 20-point PSS-4 summative scale, responses were divided evenly into tertiles so that each contained a third of the sample responses, and each category was defined by the scores contained in each tertile (0-4=reference, 5-8, 9 and higher).

Independent variables. We tested associations with two primary predictor variables: 1) household social needs, and 2) mother's level of acculturation.

Household social needs variables were constructed in two ways: 1) categorical level of household need (primary aim), and 2) select independent household needs (secondary aim). Categorical level of household need was based on the total count of the number of mothers' "yes" responses to current concerns about 18 possible social issues for either themselves or members of their household. The list of needs to choose from included: *financial* (problems paying utility or medical bills, denied other income support, no health insurance), *housing* (difficulty finding housing, or habitability concerns), *food* (running out of food before having money to buy more), *transportation* (difficulty affording transportation or disability paratransit), *employment* (difficulty finding or problems with a job, disability interfering with work, difficulty obtaining unemployment benefits), *legal* (deportation, child support or family law issues), or *other* (no primary care provider, difficulty finding childcare or after-school activities, bullying or household mental health concerns). The total number of needs was then divided into three categorical groups, first separating out those participants who reported no needs (none=ref), and then dividing the remaining number of subjects into two relatively even groups for analysis (1-3 needs, 4 or more needs).

In order to minimize the risk of chance findings due to multiple comparisons, from the list of 18 needs we selected 7 of the most often reported needs (those with a frequency of 30% or

greater) to test as independent predictor variables for our secondary aim: problems paying utility bills, unstable housing, habitability problems (e.g., mold or infestations), running out of food, difficulty finding a job, difficulty affording transportation, or other legal issues (no=ref, yes).

Level of acculturation was measured by the mothers' reports of preferred language on the survey (English=reference, Spanish), where Spanish-preferring participants were considered to have a lower level of acculturation. Language has been considered a valid proxy measure of acculturation in research, particularly in secondary analyses when more multidimensional scales of acculturation were not included as part of the original study.^{104,194}

Covariates. Covariates included sociodemographic and health characteristics that have known associations with maternal mental health,^{124,208} stress,^{105,111,209} or social needs.^{18,19,23,124} The following covariates were used in all models: mother's age in years (18-24=reference, 25-34, 35-44, 45 and older), child's age in years (0-4 years, 5-17 years=reference), mother's highest level of completed education (less than high school=reference, high school/general educational development [GED], technical school/some college, college graduate/graduate school), and mother's current employment status (employed=reference, unemployed). We decided not to include income as a covariate because almost 90% of the sample reported a household income under \$50,000, and income was closely correlated with mother's education. Finally, we included mothers' ratings of their own physical health, via responses ranging on a 5-point scale from 0 (poor) to 4 (excellent) to one item from the Global Physical Health sub-scale of the PROMIS Global® instrument:²¹⁰ "In general, how would you rate your physical health?" (recoded into two groups as good/very good/excellent=reference, poor/fair).

Data Analysis

Data were analyzed using Stata, version 16 statistical software (College Station, TX, USA). Descriptive statistics summarized the overall sociodemographic and health characteristics of the study sample and the dependent and independent variables, and chi-square analyses compared characteristics of English vs. Spanish-preferring participants. In the analysis of our primary outcomes, although the outcome variables were ordinal in nature, the relationships between groups at different levels of the outcome were not equal, preventing us from using a proportional odds model or ordered logistic regression. Instead, we converted to categorical variables and used multinomial logistic regression to model frequency of maternal emotional problems (with never/rarely as the reference group) or perceived stress (with a score of 0 to 4 as the reference group) as functions of household social needs and mother's language, controlling for the socio-demographic and health covariates. Results from the multinomial models are relative risk ratios (RRs) comparing the emotional problems or perceived stress categories to the reference group. For our primary aim, each outcome was modeled with the categorical levels of social needs. For our secondary aim, each outcome was modeled using one social need at a time along with language and the covariates, resulting in seven separate models.

Results

Demographic and Descriptive Characteristics

Sociodemographic and health characteristics are summarized for the sample (Table 1). Most of the sample preferred to answer the survey in Spanish (85%). Overall, 22% reported being often or always bothered by emotional problems in the past week, with English-preferring participants significantly more likely to report often/always being bothered by problems than Spanish-preferring (32% vs. 20%, $p < 0.01$). The mean PSS-4 score was 5.53 (SD: 3.20, Range: 0-15; results not shown in table) and 31% of the sample had a high perceived stress score, with no

significant difference between language groups. The median total count of social needs was 3 (Range: 0-18; Mean: 4.13, SD: 3.18; results not shown in table). Most of the full sample reported having at least one social need (90%), and almost half reported having four or more needs (49%). The most reported needs were difficulty paying utility bills (39%), unstable housing (39%) and food insecurity (36%). “Other legal issues”, reported by 30% of participants, was the only independent need to show significant differences between the language groups, with Spanish-preferring more likely than English-preferring participants to report this need (31% vs. 18%, $p = 0.03$). Over half of the sample reported less than a high school education (58%) and of these, significantly more were Spanish-preferring (64% vs. 18%, $p < 0.01$). Most mothers rated their own physical health as good, very good, or excellent (63%).

Primary Outcomes

Emotional problems. In the fully adjusted multinomial model, having any number of social needs predicted significantly higher risk of being often or always bothered by emotional problems over the past week, compared with rarely or never being bothered, (1 to 3 needs: $RR=5.89$; 95% CI: 1.28, 26.92; $p = 0.02$; 4 or more needs: $RR=15.03$; 95% CI: 3.31, 68.23; $p < 0.01$) (Table 2). Spanish language predicted lower risk of often or always being bothered by problems ($RR=0.21$; 95% CI: 0.08, 0.51; $p < 0.01$). In the adjusted multinomial models using separate social needs and language as independent variables, all needs were significantly associated with greater risk of being often/always bothered by emotional problems compared with rarely/never being bothered ($p < 0.05$), except for legal issues (see Table 3 for detailed results). Spanish language again predicted lower risk of being often/always bothered by emotional problems, across all models (RR range 0.23 – 0.26; $p < 0.01$; results not shown in table).

Perceived stress. In the first adjusted multinomial model of perceived stress (Table 4), reports of 4 or more household social needs significantly predicted greater risk for a high PSS-4 score (9 or greater), compared with having a low PSS-4 score (0 to 4) (RR=4.97; 95% CI: 1.87, 13.91; $p < 0.01$). In separate adjusted multinomial models, each social need predicted greater risk of high perceived stress score compared with low ($p < 0.05$), except for legal issues (see Table 5 for detailed results). Language was not significantly associated with perceived stress in any models (not all results shown in tables).

Discussion

Our study is the first to test associations between level of or individual household social needs and symptoms of emotional problems and stress in Latinx mothers. Over 22% of mothers in the sample reported often or always being bothered by problems of anxiety, irritability, or depression in the prior week. This is higher than national data in which an estimated 9% of Latinx adults (not limited to mothers) reported regularly having “feelings of worry, nervousness, or anxiety” and 4% reported regularly “having feelings of depression”.¹¹⁸ Over 31% of our sample had a PSS-4 score over 8; this indicates that almost one-third of our sample was experiencing high stress, based on levels ranging from 4 to 8 used in previous studies as potential thresholds for high stress.^{211,212} In a recent national survey, Latinx respondents reported an average stress level of 6.1 out of 10 (with 10 meaning “a great deal of stress”), compared with non-Latinx Whites who report an average of 5.3 out of 10.¹¹⁹

Our measure of high level of social needs was a strong predictor of both emotional problems and perceived stress. Utility bills, food, housing, habitability, employment, transportation, and legal support were the most commonly reported concerns in our sample, consistent with national prevalence data,¹²⁹ and most of these needs also independently increased

the risk for emotional problems and perceived stress. These findings are unique; though food insecurity has been extensively studied and found to be independently associated with serious psychological distress in both low-income parents^{129,185,186} and Latinx populations,^{187,213} little prior evidence has demonstrated associations between other needs and emotional health in Latinx mothers. We were unable to examine causal relationships in this cross-sectional study, though it is likely that there are bidirectional influences between economic disadvantage and emotional dysfunction.^{129,214,215} Future work should explore the mechanisms linking these factors in the Latinx population.

Current clinical practice guidelines independently recommend screening for depression²¹⁶ and social determinants of health in adult populations²¹⁷ in primary care, though they do not link the two nor clearly articulate which social needs should be included in these assessments (beyond income or education status). The strong associations between social needs and maternal emotional problems in our study might inform future recommendations about linking maternal mental health and material deprivation screening initiatives, not only in medical or behavioral health settings, but also in social service agencies, with the goal of strengthening identification and targeted interventions. More work is needed to understand the pathways and mechanisms underlying these associations, particularly in low-income Latinx populations, to further these efforts.

Another important finding from our analyses was that being less acculturated, as per language preference proxy, predicted lower risk of emotional problems. The association between acculturation and emotional problems may be related to social support, an important facet of many Latinx cultures that appears to be stronger in less acculturated individuals³³ and that has been shown to lessen emotional distress in Latinx mothers.^{82,218} Future research using

multidimensional measures of acculturation and cultural influence could help unpack the relationships between social needs, acculturation, and cultural considerations, including the potential benefits from increased social support, or other protective cultural factors represented by lower acculturation. This work should help to inform whether clinic-based interventions to address the mental health and social needs of Latinx mothers could be strengthened by initiatives that focus on known beneficial cultural influences such as social supports.^{16,219}

We were surprised that acculturation did not similarly impact perceived stress. One explanation is that constructs assessed by the single PROMIS question and PSS-4 differ. The PSS-4 primarily asks the participant to report on feelings of control or capacity related to life stressors,²⁰⁶ whereas the PROMIS question asks about the level of bother caused by emotional symptoms.²²⁰ In our study it is therefore possible that the protective factors associated with lower acculturation are more closely related to the participant's experience of bother related to their emotional symptoms, rather than their confidence in handling stress. This concept may be further impacted by stigma in the Latinx community that the inability to cope with mental health challenges is related to personal weakness,¹³⁰ and it is possible that participants were more willing to disclose bother from emotional symptoms – a potentially more benign concept – but less so the ability to handle stress. Cultural factors may also influence the interpretation of these constructs,²⁰⁰ and the ethnic diversity of Latinx subgroups could contribute to variability in survey responses that limit the ability to detect significant associations with stress.^{130,221}

Limitations

There are important limitations to this work that may affect the interpretation of findings. First, though our sample size of Latinx participants was relatively large, the primarily low income and education level of the group limit generalizability to communities with similar

economic disadvantage. Second, survey bias in this study may be increased because of the potential stigma associated with both mental health²⁹ and economic status.¹⁹² Third, our decision to analyze a single item from the PROMIS Global scale rather than score the full ten items may reduce its criterion validity. Fourth, we relied on secondary data, which limited our ability to test other variables likely relevant to emotional problems and stress in our study population, including factors related to parenting, immigration, and multidimensional aspects of acculturation. Lastly, we acknowledge that the Latinx population is not monolithic, and the generalizability of our findings would have been enhanced by the ability to explore potential influences of ethnicity or geographic origin^{194,222} that were not obtained in the original RCT.

Conclusion

Our findings suggest that social needs put Latinx mothers at significant risk for emotional distress and stress. Latinx women make up a large and growing percentage of the U.S. population and labor force; the impact of their mental health outcomes on the economy and community,²²³ as well as on their children's health,⁴ cannot be ignored. More work is needed to explore the potential for integrating social needs and mental health assessments into services for Latinx mothers, and the cultural influences that might be leveraged to better tailor interventions to better address unmet needs for this group.

Table 1. Sociodemographic and Health Characteristics (N=455)

	All (n=455)	English (n=64)	Spanish (n=391)	<i>p</i>
Maternal Bother from Emotional Problems				
Never/Rarely	166 (36.48)	12 (18.75)	154 (39.39)	<0.01
Sometimes	188 (41.32)	31 (48.44)	157 (40.15)	
Often/Always	101 (22.20)	21 (32.81)	80 (20.46)	
Maternal PSS-4 Score				
0 to 4	172 (37.80)	17 (26.56)	155 (39.64)	0.12
5 to 8	139 (30.55)	24 (37.50)	115 (29.41)	
9 to 20	144 (31.65)	23 (35.94)	121 (30.95)	
Household Level of Social Needs				
None	42 (9.23)	5 (7.81)	37 (9.46)	0.79
1-3 needs	190 (41.76)	29 (45.31)	161 (41.18)	
4 or more needs	223 (49.01)	30 (46.88)	193 (49.36)	
Most Frequently Reported Social Needs				
Problems paying bills	180 (39.56)	29 (45.31)	151 (38.62)	0.31
Unstable housing	178 (39.12)	31 (48.44)	147 (37.60)	0.09
Habitability problems (e.g., mold)	136 (29.89)	21 (32.81)	115 (29.41)	0.58
Running out of food	167 (36.70)	30 (46.88)	137 (35.04)	0.06
Difficulty finding a job	142 (31.21)	25 (39.06)	117 (29.92)	0.14
Difficulty affording transportation	143 (31.43)	23 (35.94)	120 (30.69)	0.40
Other legal issues (e.g., deportation)	137 (30.11)	12 (18.75)	125 (31.97)	0.03
Maternal Age in Years				
18-24	61 (13.41)	18 (28.12)	43 (11.00)	<0.01
25-34	185 (40.66)	25 (39.06)	160 (40.92)	
35-44	178 (39.12)	20 (31.25)	158 (40.41)	
45 or older	31 (6.81)	1 (1.56)	30 (7.67)	
Child Age in Years				
0-4	235 (51.65)	36 (56.25)	199 (50.90)	0.42
5-17	220 (48.35)	28 (43.75)	192 (49.10)	
Maternal Highest Education Completed				
Less than High School	264 (58.02)	12 (18.75)	252 (64.45)	<0.01
High school/GED	127 (27.91)	28 (43.75)	99 (25.32)	
Technical school/Some College	40 (8.79)	18 (28.12)	22 (5.63)	
College Graduate/Graduate school	24 (5.27)	6 (9.38)	18 (4.60)	
Maternal Employment Status				
Employed	294 (64.62)	46 (71.88)	248 (63.43)	0.19

Unemployed	161 (35.38)	18 (28.12)	143 (36.57)	
Maternal PROMIS Physical Health Rating				
Good/Very Good/Excellent	287 (63.08)	35 (54.69)	252 (64.45)	0.13
Poor/Fair	168 (36.92)	29 (45.31)	139 (35.55)	

Table 2. Multinomial Regression Model of Maternal Bother from Emotional Problems on Household Level of Social Needs and Maternal Language (N=455)†

	Sometimes Bothered			Often/Always Bothered		
	RR	95% CI	p	RR	95% CI	p
Household Level of Social Needs						
None=ref	---	---	---	---	---	---
1-3 needs	2.12	(0.97, 4.63)	0.06	5.89	(1.28, 26.92)	0.02
4 or more needs	4.36	(1.98, 9.58)	<0.01	15.03	(3.31, 68.23)	<0.01
Maternal Preferred Language						
English=ref	---	---	---	---	---	---
Spanish	0.31	(0.14, 0.70)	<0.01	0.21	(0.08, 0.51)	<0.01
Maternal Age in Years						
18-24=ref	---	---	---	---	---	---
25-34	1.32	(0.64, 2.72)	0.43	1.42	(0.57, 3.50)	0.44
35-44	0.70	(0.33, 1.47)	0.35	1.06	(0.42, 2.68)	0.88
45 or older	0.49	(0.15, 1.54)	0.22	0.98	(0.25, 3.78)	0.98
Child Age in Years						
0-4=ref	---	---	---	---	---	---
5-17	1.86	(1.14, 3.06)	0.01	1.44	(0.79, 2.60)	0.22
Maternal Highest Education Completed						
Less than High School=ref	---	---	---	---	---	---
High school/GED	0.68	(0.40, 1.16)	0.16	0.66	(0.35, 1.26)	0.21
Technical school/Some College	0.79	(0.33, 1.89)	0.60	0.66	(0.23, 1.87)	0.44
College Graduate/Graduate school	0.76	(0.27, 2.14)	0.60	0.54	(0.15, 1.94)	0.35
Maternal Employment Status						
Employed=ref	---	---	---	---	---	---
Unemployed	1.38	(0.85, 2.24)	0.18	1.24	(0.69, 2.23)	0.45
Maternal PROMIS Physical Health Rating						

Good/Very Good/Excellent=ref	---	---	---	---	---	---
Poor/Fair	1.96	(1.20, 3.22)	<0.01	3.29	(1.87, 5.78)	<0.01

ref=reference group

Table 3. Multinomial Regression Model of Maternal Bother from Emotional Problems on Most Frequent Social Needs, N=455)†

	Sometimes Bothered			Often/Always Bothered		
	RR	95% CI	p	RR	95% CI	p
Most Frequent Social Needs (no=ref)						
Problems paying bills	2.43	(1.51, 3.89)	<0.01	2.57	(1.48, 4.45)	<0.01
Unstable housing	1.67	(1.05, 2.66)	0.02	2.03	(1.18, 3.49)	0.01
Habitability problems	1.93	(1.16, 3.22)	0.01	2.40	(1.34, 4.30)	<0.01
Running out of food	2.43	(1.50, 3.93)	<0.01	2.32	(1.33, 4.07)	<0.01
Difficulty finding a job	1.60	(0.98, 2.63)	0.06	1.90	(1.07, 3.37)	0.02
Difficulty affording transportation	1.89	(1.15, 3.11)	0.01	2.13	(1.20, 3.79)	<0.01
Other legal issues	1.41	(0.86, 2.29)	0.16	1.51	(0.85, 2.69)	0.15

ref=reference group

42 †Results reported are for separate models of the outcome on each independent variable. All models also included preferred language and all covariates (not shown). Spanish language predicted lower risk of being often/always bothered by emotional problems, across all above models (RR range 0.23 – 0.26; $p < 0.01$; not shown).

Table 4. Multinomial Regression Model of Perceived Stress on Household Level of Social Need and Maternal Language, N=455)†

	PSS-4 Score 5 - 8			PSS-4 Score 9 - 20		
	RR	95% CI	p	RR	95% CI	p
Household Level of Social Needs						
None=ref	---	---	---	---	---	---
1-3 needs	1.15	(0.51, 2.58)	0.72	2.17	(0.81, 5.79)	0.12
4 or more needs	1.83	(0.81, 4.12)	0.14	4.97	(1.87, 13.19)	<0.01
Maternal Preferred Language						
English=ref	---	---	---	---	---	---
Spanish	0.78	(0.36, 1.66)	0.52	0.62	(0.29, 1.33)	0.22
Maternal Age in Years						
18-24=ref	---	---	---	---	---	---
25-34	0.45	(0.21, 0.96)	0.04	0.89	(0.39, 2.01)	0.78
35-44	0.44	(0.20, 0.96)	0.04	0.62	(0.26, 1.45)	0.27
45 or older	0.19	(0.05, 0.64)	<0.01	0.24	(0.06, 0.86)	0.02
Child Age in Years						
0-4=ref	---	---	---	---	---	---
5-17	1.14	(0.68, 1.91)	0.61	1.45	(0.87, 2.41)	0.15
Maternal Highest Education Completed						
Less than High School=ref	---	---	---	---	---	---
High school/GED	1.06	(0.61, 1.85)	0.81	0.74	(0.42, 1.30)	0.29
Technical school/Some College	1.86	(0.75, 4.57)	0.17	0.97	(0.37, 2.51)	0.95
College Graduate/Graduate school	1.73	(0.55, 5.37)	0.34	1.30	(0.42, 3.97)	0.64
Maternal Employment Status						
Employed=ref	---	---	---	---	---	---
Unemployed	1.17	(0.71, 1.94)	0.53	0.88	(0.52, 1.47)	0.62

Maternal PROMIS Physical Health Rating						
Good/Very Good/Excellent=ref	---	---	---	---	---	---
Poor/Fair	2.82	(1.69, 4.72)	<0.01	2.44	(1.46, 4.08)	<0.01

ref=reference group

Table 5. Multinomial Regression Model of Perceived Stress on Most Frequent Social Needs, N=455)†

Most Frequent Social Needs (no=ref)	5-8			9 - 20		
	RR	95% CI	p	RR	95% CI	p
Problems paying bills	1.24	(0.75, 2.03)	0.38	2.13	(1.32, 3.44)	<0.01
Unstable housing	1.19	(0.73, 1.94)	0.47	1.61	(1.00, 2.60)	0.04
Habitability problems	1.32	(0.77, 2.26)	0.30	2.05	(1.23, 3.43)	<0.01
Running out of food	1.67	(1.00, 2.78)	0.04	2.75	(1.68, 4.50)	<0.01
Difficulty finding a job	1.32	(0.77, 2.26)	0.29	2.36	(1.42, 3.93)	<0.01
Difficulty affording transportation	1.43	(0.84, 2.42)	0.18	2.17	(1.31, 3.60)	<0.01
Other legal issues	1.76	(1.04, 2.95)	0.03	1.41	(0.84, 2.36)	0.19

ref=reference group

†Results reported are for separate models of the outcome on each independent variable. All models also included preferred language and all covariates (not shown). Spanish language was not significantly associated with outcomes in any of the models.

VI. Study Part Two

Associations between Household Social Needs, Emotional Function, and Stress in Low-Income Latinx Children and their Mothers

Poor child emotional health can influence child development, interfere with daily functioning, and impact well-being into adulthood.^{1,15} Over the last two decades, the prevalence of emotional disorders such as anxiety and depression in children in the U.S. has steadily increased,^{15,51} though it still may be underestimated secondary to numerous well-studied barriers to accessing mental health diagnosis and treatment services in disadvantaged communities.^{1,23,25} At almost \$11 billion annually, the costs associated with pediatric emotional and behavioral health conditions are higher than costs for any other child health disorder.^{15,49}

Etiology of Child Emotional Dysfunction

Given the known associations between poverty and economic disadvantage and multiple child physical health outcomes, it is not surprising that low household income is associated with higher rates of child emotional dysfunction.^{15,23} In recent studies, these associations between poverty and child health have been shown to be mediated by material hardship,^{18,22} which is measured by the ability to meet basic social needs like housing and food.¹⁷ Other studies have distinguished between the concepts of income poverty and material hardship, showing that families may experience persistent material hardship even if they only endure short-term or transient episodes of income poverty, and that unmet needs may contribute more to stress than income poverty.^{3,18}

Over 50% of Latinx households report having any social needs, as compared to 34% of White, non-Latinx households, regardless of income poverty level.¹⁷⁵ Global economic hardship is associated with an increased risk for depression in Latinx parents,^{82,111} and food insecurity is

independently associated with serious psychological distress in Latinx adult populations.¹⁸⁷

Mothers that experience economic hardship are at higher risk for both depression^{3,4,82,111} and parenting stress,^{110,111,117} and maternal depression and stress have each been independently linked to child emotional dysfunction.^{4,23,110} Poor maternal mental health may negatively impact child emotional health by exposing the child to, or limiting the parent's ability to protect the child from, chronic stress in the environment.²¹

Despite this preliminary work, the research on maternal-child emotional health and social needs in U.S. Latinx populations is sparse. The paucity of evidence may be due in part to barriers in participant recruitment and data collection unique to this group.^{25,29} Much of the current data that exists on these topics is gathered from large survey-based population studies that fail to include sizeable numbers of Latinx families.²⁹ Evidence on emotional disorders in Latinx populations is additionally limited because many studies fail to account for cultural influences on survey item endorsement and social desirability bias – participants' tendency to provide responses that they consider to be more favorable or acceptable.²⁹ The sensitive nature of social needs, particularly around the use of public benefits, also has raised concern for social need underreporting.¹⁹²

Biomarkers of Stress

The limitations of survey-based research related to emotional health and social needs in Latinx populations has spurred interest in physiologic measures of stress that can be used as proxies for emotional health. The rationale for using physiologic biomarkers of child emotional dysfunction is that chronic stress exposure activates certain inflammatory and hormonal processes at persistent and eventually harmful levels, and in some cases this chronic stress alters gene regulation or expression, or brain structure and function, which impacts emotional

health.^{1,21,42,134} Release of the glucocorticoid hormone, cortisol, produces diverse genomic, metabolic and physiological changes in response to stress^{135,136} and is now widely used as a biomarker for stress in both adults and children.¹³⁴ Several studies have found elevated cortisol levels to correlate with poverty,^{22,117} anxiety or depression symptoms,^{136,146} food insecurity,¹⁴⁵ and reports of racial discrimination,¹⁵⁵ among other outcomes. Some studies also have explored concordance between cortisol levels of mothers and their children in response to stress, and the factors that may moderate this relationship.^{148-152,224-228} However, little research on biomarkers has focused on Latinx mothers and children. Given the unique experiences of Latinx sub-populations in the US, more robust studies are needed to better explore and interpret biomarkers in these groups.

Aims and Hypotheses

The primary aim of the study was to investigate associations between level of household social needs, maternal stress, and child emotional function and stress, using survey and biomarker data from Latinx mothers and their children. We hypothesized that high level of household social needs, maternal perceived stress score, and maternal hair cortisol concentration (HCC), would independently and collectively predict increased child emotional dysfunction and child HCC. Our secondary aim was to explore whether specific social needs were associated with child emotional dysfunction or child HCC.

Methods

Study Design, Setting and Sample

This study is a secondary analysis of cross-sectional survey and biomarker data obtained from children and their caregivers during the enrollment phase of the Health Advocates Study II (HASII), conducted between July 2016 and June 2018 in the children's urgent care of a pediatric

primary care center nested in a large county hospital in San Francisco, California. The details of enrollment and inclusion criteria were published previously.²⁰¹ The current study limited the sample to one child per family and to children whose mothers were the enrolled caregiver (n=549), self-reported Hispanic or Latino origin or descent (n=455), and for whom there was complete maternal hair cortisol data (n=432).

Protection of Human Subjects

HASII was approved by University of California, San Francisco Institutional Review Board (IRB), and only subjects who consented according to the IRB-approved protocol were included in this study sample. These secondary analyses of deidentified data were deemed exempt from full review by the Committee for the Protection of Human Subjects at the University of California, Davis.

Study Measures and Variables

The child was the unit of analysis; measures collected about the child's mother were included in the analytic models of child health outcomes. At enrollment, mothers of children in HASII completed surveys (in English or Spanish) about themselves and their children, including questions designed to capture their demographic characteristics, social situation and needs, physical and mental health status, and experiences with adverse events and stress. A hair sample of approximately 3 cm measured from the scalp was also obtained from each child and mother with sufficient hair length.

Outcome variables. Two primary outcomes were examined: 1) child emotional function and 2) child HCC.

Child emotional function was measured based on caregiver survey report using the parent-proxy version of the Pediatric Quality of Life Measurement Model (PedsQL™).²²⁹ The

PedsQL™ 4.0 generic core scales measure the perception of health-related quality of life for children and adolescents in the areas of physical, emotional, social, and cognitive or school functioning.²³⁰ The PedsQL™ generic core scales have been demonstrated to be reliable and valid in a number of studies,^{229,230} including those specifically focused on children with mental health conditions²³¹ and from Spanish-speaking families.^{232,233} In those studies, internal consistency reliabilities exceeded the minimum reliability standard of 0.70 required for group comparisons; total scale scores approached or exceeded the recommended alpha criterion of 0.90; construct validity was demonstrated using a known groups approach.^{229,230} In HASII, mothers completed the parent-proxy version²²⁹ of the PedsQL™ generic core scales about their children. In the emotional function core scale (PedsQL™-EF), parents are asked to assess whether particular symptoms (e.g., sadness, anger, worry) have been a problem for the child over the past month. Items are scored on a five-point Likert scale ranging from 0 (never a problem) to 4 (almost always a problem) and converted to a reverse 100-point scale (where 0=100 and 4=0) with higher scores indicating better function.²³⁰ We dichotomized responses as “high function” (score \geq 64, coded as the reference group) vs. “low function” (score $<$ 64), based on recommended PedsQL™-EF cutoff scores for risk of low child emotional function in a large ethnically diverse (61% Latinx) population study of healthy children.²³⁴

Child HCC was measured using an established liquid chromatography-mass spectrometry (LC-MS) protocol.¹³⁷ HCC results are given in units of picogram per milligram (pg/mg).²³⁵ While some studies have attempted to establish normal reference ranges for hair cortisol concentration in healthy children,²³⁵⁻²³⁷ robust evidence in this area is still lacking, particularly in ethnically diverse samples. Although there has not been agreement on a specific reference range for HCC values, it is widely accepted in the literature that higher levels indicate prolonged

activation of the hypothalamic-pituitary-adrenal (HPA) axis, a marker for a chronic physiologic stress response.^{134,136,138} HCC values were divided into tertiles for analysis so that each contained a third of the sample, and categories were defined by the values reflected in each: “low” (0.22 – 3.99 pg/mg; coded as the reference group), “middle” (4.00 – 7.82 pg/mg) and “high” (7.84 – 1998.88 pg/mg).

Independent variables. Three primary predictor variables were examined: 1) household social needs, 2) maternal perceived stress, and 3) maternal HCC.

Household social needs were determined by mothers’ survey response of “yes” or “no” to current concerns about 18 possible issues for either themselves or members of their household (no=reference, yes), using a social risk screening questionnaire adapted from earlier studies.^{201,238,239} Household social needs variables were constructed in two ways: 1) level of household needs (primary aim), and 2) indication of an individual household need (secondary aim). Household level of social needs was determined by a summative count of needs and divided into categorical groups for analysis, the first with those who reported no needs, and the remainder divided into three evenly distributed groups: “none” (0 needs=ref), 1-2 needs, 3-4 needs, and 5 or more needs. Options for individual social needs included: *financial* (problems paying utility or medical bills, denied other income support, no health insurance), *housing* (difficulty finding housing and habitability concerns), *food* (running out of food before having money to buy more), *employment* (difficulty finding or problems with a job, disability interfering with work, difficulty obtaining unemployment benefits), *transportation* (difficulty affording transportation or disability paratransit), *legal* (deportation, child support or family law issues), and *other* (no primary care provider, difficulty finding childcare or after-school activities, bullying or household mental health concerns).

Maternal perceived stress was measured with the Perceived Stress Scale-4 (PSS-4), a shortened version of the full instrument²⁰⁵ that measures the degree to which adults perceive stress in their control over or ability to handle events in their lives over the past month.²⁰⁶ The four items are scored on a five-point Likert scale ranging from 0 (never) to 4 (very often), where summative higher scores reflect higher perceived stress.²⁰⁶ The PSS-4 tool is shown to be reliable and valid in studies of English-speaking²⁰⁶ and Spanish-speaking²⁰⁷ participants. In these studies, internal consistency reliabilities for the instrument exceeded the minimum reliability standard of 0.70 for both English and Spanish, and alphas were adequate for both language groups.^{206,207} Responses on the 20-point PSS-4 summative scale were divided into tertiles – each containing a third of responses – and each tertile category was defined by the scores reflected in that group: “low stress” (score: 0-4; coded as the reference group), “moderate stress” (score: 5-7), and “high stress” (score: 8 and higher).

Maternal physiologic stress was measured with HCC as described above for child HCC, divided categorically into tertiles and defined by the values in each: “low” (0.22 – 3.99 pg/mg; coded as the reference group), “middle” (4.00 – 7.82 pg/mg) and “high” (7.84 – 1998.88 pg/mg).

Covariates. Sociodemographic and other physical and mental health characteristics theoretically associated with perceived and physiologic stress,^{21,134,138} emotional health,¹ or social needs,^{18,23} were included as covariates. In all models, sociodemographic covariates included mother’s age (18-24 years=reference, 25-34 years, 35-44 years, 45 years and older), child’s age divided into preschool, school age, and teen (0-5 years=reference, 6-12 years, 13-17 years), child’s gender (male=reference, female), preferred language of the mother (English=reference, Spanish), mother’s highest level of education (less than high school=reference, high school or general educational development [GED], some college or

technical school, college/graduate degree), and annual household income (less than \$20,000=reference, \$20,000-50,000, more than \$50,000, don't know/decline to state).

Child health characteristics included health status, reported by the mother's responses on a 5-point scale ranging from poor to excellent to the statement, "In general, would you say your child's health is" (recoded into three groups as poor/fair=reference, good, very good/excellent); and child's physical function, rated on the PedsQL™ physical function 100-point scale and dichotomized as "high function" (score ≥ 64 , coded as the reference group) vs. "low function" (score < 64) according to evidence-based cutoffs for this tool.²³⁴ Maternal health characteristics included symptoms of depression, measured as a summative score on the Patient Health Questionnaire-8 (PHQ-8) instrument and dichotomized according to evidence-based cutoffs²⁴⁰ (score 0-5: "mild"=reference, score >5 : "moderate/severe"); and physical health rating on the two-item Patient-Reported Outcomes Measurement Information System (PROMIS®) global physical health scale,²¹⁰ measured by responses on a 5-point scale ranging from poor to excellent to the question, "In general, how would you rate your physical health?" (recoded into three groups as poor/fair=reference, good, very good/excellent).

Data Analysis

All data were analyzed with Stata, version 16 statistical software (College Station, TX, USA). Descriptive statistics summarized the overall sociodemographic and health characteristics of the study sample and the dependent and independent variables. Although the primary outcome variable of child emotional function was ordinal in nature, the relationships between groups at different levels of the outcome were not equal, preventing us from using a proportional odds or ordered logistic regression model. Instead, we converted to categorical variables and used multiple binomial logistic regression in our analysis, to model child emotional function (with

high function as the reference group) as a function of household social needs, maternal perceived stress, maternal HCC, and the sociodemographic and health covariates. Results from the binomial models are odds ratios (OR) comparing the independent variable categories to the reference group.

In the first set of models, each social need was analyzed separately as an independent variable, controlling for maternal perceived stress, maternal HCC, and all covariates. In the second model, we used categorical level of social needs as the independent variable. In the analysis of child HCC, we used multinomial logistic regression to model child HCC (measured as low=reference group, middle, and high HCC tertiles) as functions of household social needs, maternal perceived stress, maternal HCC, and the sociodemographic and health covariates. Results from the multinomial models are relative risk ratios (RR). We ran the multinomial logistic regressions first using individual social needs and second using categorical level of social needs as independent variables.

Results

Descriptive Findings

Sociodemographic and health characteristics. Table 1 summarizes frequencies for sociodemographic and health characteristics for the study sample. Most mothers were between the ages of 25 and 44 years, and over half the children were less than 6 years old. The sample of children was relatively evenly divided between males and females. Approximately 86% of mothers in the sample reported Spanish as their preferred language, 57% reported less than a high school diploma as the highest level of education completed, and 53% of the sample reported an annual household income of less than \$20,000. Most mothers in the sample rated their child's overall health as good or very good/excellent and reported that their children had high physical

function. Over one-third of mothers rated their own physical health as poor or fair, and almost half scored in the moderate to severe range for depression risk.

Household social needs. About 90% of mothers reported at least one current social need in their household, and well over one-third reported having more than five social needs.

Descriptive statistics for reported social needs are presented in Table 2. Problems paying bills (39%), housing instability (38%), and food insecurity (36%) were the most commonly reported social needs. Almost one-third of participant households reported job, habitability, transportation, or legal needs, or difficulty finding after-school activities for their children.

Maternal stress. The median score on the PSS-4 was 6 (range: 0, 15; mean: 5.49, SD: 3.21). Median maternal HCC for the full sample was 5.47 pg/mg (range: 0.22, 1998.88; mean: 35.24, SD: 142.83). Maternal HCC values in the middle tertile ranged from 4.00 to 7.82 pg/mg, and in the highest tertile from 7.84 to 1998.88 pg/mg. After verifying with our laboratory that the unusually high HCC values in the sample were not due to measurement or processing error, we also tested the models after removing very large observations – participants whose HCC was greater than 3SD outside of the mean.²⁴¹ Overall significance of findings was unchanged when these observations were removed so results presented here include the full sample.

Regression Models

Primary outcome: child emotional function. In the full sample, 41% of children scored at risk for emotional dysfunction on the PedsQL™-EF. In all fully adjusted binomial regression models (Table 3), moderate and high maternal perceived stress positively predicted child emotional dysfunction compared to low maternal perceived stress (moderate: OR range 1.92 – 2.73; high: OR range 1.97 – 3.43; $p < 0.05$; not all results shown in table). Neither the maternal HCC nor the level of social needs was significantly associated with child emotional dysfunction

in any of the models. For our secondary aim, almost none of the individual social needs were independently linked with child emotional dysfunction, except for finding after-school activities or opportunities (OR = 2.09; 95% CI [1.24, 3.52]; $p < 0.01$).

Primary outcome: child HCC. The subsample with complete child HCC data (N=312) was used in all child HCC outcome analyses. Chi-square analyses of the differences in sociodemographic and health characteristics between children with and without child HCC revealed that the group with child HCC data included significantly more mothers who were over 34 years old (50% vs. 35%; $p = 0.02$), more children who were female (57% vs. 35%; $p < 0.01$), fewer children ages 0 to 5 years (49% vs. 80%; $p < 0.01$), and more children with low physical function (18% vs. 8%; $p < 0.01$), as compared to the group missing HCC data (results not shown in tables). Median child HCC was 18.69 (range: 0.71, 11,965.91; mean: 382.82, SD: 1313.84). Child HCC values in the middle tertile ranged from 8.99 to 48.73 pg/mg, and in the highest tertile from 49.41 to 11,965.91 pg/mg. We again found no statistical differences in findings between models with and without the largest HCC values and thus included all participants in the sample.

In all fully adjusted multinomial models, neither household level of social needs nor maternal perceived stress score predicted middle or high child HCC compared to low child HCC (Table 4; results not all shown in table). High maternal HCC significantly predicted both middle (RR: 1.86 – 2.51; $p < 0.05$) and high child HCC (RR: 9.80 – 11.00; $p < 0.01$) in comparison to low child HCC across all models (results not all shown in table). For our secondary aim, individual social needs were not independently associated with middle or high child HCC in any of the adjusted models.

Discussion

To our knowledge, this is the first study in the U.S. to examine household social needs and maternal stress as predictors of child emotional dysfunction and child HCC in a sample of low-income and primarily Spanish-preferring Latinx families. Over 40% of the children in the sample had emotional dysfunction, a staggering finding given the evidence that low income and Latinx youth are less likely to be diagnosed with and receive treatment for emotional disorders than those from higher income or non-Latinx households.^{15,25} Similar to previous findings in non-Latinx^{148-150,153} and Latinx¹⁵¹ populations, high maternal HCC was strongly associated with high child HCC. This finding may indicate heritability of HCC and/or shared environmental risk factors.

The level of social needs in this sample was also striking. Approximately 90% of mothers reported having at least one social need, and over one-third reported having at least five needs. This far exceeds numbers for Latinx households reported in national survey research.¹⁷⁵ Our study is unique in that we asked about a large number of possible social needs, whereas much of the existing evidence in this area focuses on only a few domains of economic hardship.^{3,19,23,129,175} Accordingly, we acknowledge that our broader assessment may explain the higher levels of social needs identified in our study, though there were other indicators that this is indeed a high needs sample. For instance, problems paying bills and housing instability were the most frequent concerns for our participants, consistent with a previous report that these are the most common social needs in Latinx families with children.²⁴² Difficulty finding after-school activities for children was also a common concern and was the only individual need that significantly predicted higher odds of child emotional dysfunction. While we did not have information about immigration status, it is plausible that immigration influenced the study's urban, predominantly Spanish-preferring population. Therefore, it is also possible that policies

and legislation that require documentation of immigration status or English fluency for application to income, housing, or after-school subsidy programs may partially explain the high rates of social needs in this group.

Counter to our original hypotheses, level of household social needs did not independently predict greater risk of parent-reported child emotional dysfunction. One theory that explains this lack of association is that a mother's awareness of household social needs does not necessarily correlate with her child's experience. For example, parents may struggle with financial concerns such as paying bills or food insecurity without their child's knowledge, or families in households with food insecurity may prioritize feeding their children first (or instead) so that the child never goes hungry. Conversely, difficulty finding afterschool care or activities is a need that may be much more apparent to a child, which could explain why it was associated with greater emotional dysfunction in our sample.

Alternatively, the child's emotional response to high household social needs may somehow be mitigated by other supportive factors known to exist in Latinx populations. "Familismo" is the concept of strong family ties and values that is central to most Latinx cultures,^{82,101} and is thought to serve as a buffer against many risk factors that can contribute to physical or mental health problems in this population.^{26,33,82,83} For example, in multiple studies of Latinx families, strength of the parent-youth relationship has been shown to be a buffer between parental stress and child emotional problems.^{27,55,80,82,115} It is also important to consider that the high overall level of needs and emotional distress in our sample may have limited our ability to detect statistically significant associations between these two variables.

Household level of social needs did not independently predict greater risk of high child HCC, again in contrast to our hypothesis that social needs would be positively associated with

child stress. Our secondary exploration of individual needs also revealed no significant associations between specific social needs and child HCC. These findings contribute to an already conflicting research base on the associations between social needs and HCC in Latinx children: one recent study showed higher child HCC was associated with greater food insecurity,¹⁴⁵ while another showed no association between these variables.²⁴³ In addition to the theories related to child emotional experience discussed above, another theory that could explain the lack of association with child HCC is that prolonged stress exposure can result in a blunted or flattened cortisol response, although this has only been shown in studies examining HCC in non-Latinx populations.²⁴⁴⁻²⁴⁸ According to this theory, a family's chronic inability to meet household social needs results in a dampening of the child's ability to mount a physiologic stress response. There is still much to learn about how biomarkers can contribute to our understanding of stress and emotional function, particularly in ethnically diverse pediatric populations.¹³⁸

Mothers in this relatively large local Latinx sample seeking healthcare were primarily Spanish-preferring, with low education and very low incomes, which is consistent with the demographic of Latinx populations living in poverty in the U.S.²⁴⁹ Language is often used as a measure of acculturation,⁸¹ indicating that our sample may have included a large percentage of immigrants with lower levels of acculturation. Our findings contradict previous evidence related to the "Hispanic health paradox," which proposes that less acculturated Latinx immigrants experience genetic, lifestyle, or cultural protective factors over their U.S. born or more acculturated Latinx counterparts that contribute to better health outcomes.^{32,33,55} The significant level of reported emotional distress and high HCC in our less acculturated sample of mothers and children could provide support for another body of literature that refutes the paradox theory, although we lack a substantial comparison group to test these assumptions. The paradox theory

has been criticized for relying on methodology that favors healthier research participants and likely under-reports morbidity and mortality in immigrant populations;^{32,168} more research on this topic is warranted.

Limitations

Our study findings should be interpreted in the context of four key limitations. First, our study sample was restricted to low-income families seeking pediatric healthcare services in a single county hospital setting as well as to families willing to consent to an RCT and with time to complete study activities. The narrow population focus may limit the generalizability of our findings. Second, the cross-sectional study design of this baseline data analysis means we cannot infer the directionality of any statistical associations. Third, many studies of secondary data are vulnerable to missing data, and in this study, 30% of children were missing hair samples because they were either not obtained or samples were insufficient for analysis. This may have resulted in an over-estimation of some of the associations we report, though many of the measured demographic and health characteristics between those included and excluded from this sub-analysis were similar. Finally, our findings may also be subject to unmeasured influence by other variables that are associated with child emotional function and stress (e.g. immigration status, acculturation stress, parenting style) but were not collected as part of HASII.

Conclusion

This study contributes to a growing body of evidence linking maternal stress and social needs to child emotional dysfunction. It is one of only a small number of published studies examining the physiologic impact of stress and social needs specifically in Latinx populations and adds new evidence on the use of HCC as a measure of stress in Latinx children and mothers. Our study findings have multiple implications for health policy, clinical practice, and research.

We found that household social needs in low-income Latinx families with children are high, particularly related to financial and housing insecurity, calling attention to the need for policies that expand access to public assistance programs and remove barriers related to immigration status. Our findings provide further evidence that stress in Latinx mothers increases the risk for poor child emotional health.^{4,23} The evaluation of maternal perceived stress may therefore be an important component of early identification and intervention related to child emotional health. Integrated caregiver and child behavioral health services in healthcare settings that serve low-income Latinx families may improve early diagnosis and intervention for youth at risk for stress and emotional dysfunction. Future research should explore the utility of HCC as a measure of stress in Latinx populations, as well as resilience and other supportive factors that may mitigate the impact of stress and social needs on emotional health in these vulnerable families.

Table 1. Sociodemographic and Health Characteristics (N=432)

Covariates	n (%)
Maternal Age in Years	
18-24	55 (12.73)
25-34	179 (41.44)
35-44	167 (38.66)
45 or older	31 (7.18)
Age of Child in Years	
0-5	252 (58.33)
6-12	126 (29.17)
13-17	54 (12.50)
Gender of Child	
Female	221 (51.16)
Maternal Preferred Language	
English	60 (13.89)
Spanish	372 (86.11)
Highest Education Level Completed	
Less than high school	247 (57.18)
High school/GED	121 (28.01)
Technical school/Some college	40 (9.26)
College graduate/Graduate school	24 (5.56)
Annual Household Income	
Less than \$20,000	231 (53.47)
\$20,000-50,000	142 (32.87)
More than \$50,000	10 (2.31)
Don't know/decline to state	49 (11.34)
Overall Rating of Child Health	
Poor/Fair	48 (11.11)
Good	191 (44.21)
Very good/Excellent	193 (44.68)

Dependent and Independent Variables	n (%)
Child PedsQL-EF Score	
High function	256 (59.26)
Low function (<64)	176 (40.74)
Child Hair Cortisol Level^a	
Lowest tertile=ref	104 (33.33)
Middle tertile	104 (33.33)
Highest tertile (≥ 37.39 pg/mg)	104 (33.33)
Maternal PSS-4 Score	
Low stress	165 (38.19)
Moderate stress	131 (30.32)
High stress (≥ 8)	136 (31.48)
Maternal Hair Cortisol Level	
Lowest tertile=ref	144 (33.33)
Middle tertile	144 (33.33)
Highest tertile (≥ 7.41 pg/mg)	144 (33.33)

^aDue to missing child hair cortisol data, N=312

Child PQL Physical Function Score	
High function	364 (84.26)
Low function (<64)	68 (15.74)
Maternal PHQ-8 Depression Risk Score	
Mild	223 (51.62)
Moderate/Severe (>5)	209 (48.38)
Maternal PROMIS Physical Health Rating	
Poor/Fair	161 (37.27)
Good	219 (50.69)
Very good/Excellent	52 (12.04)

Table 2. Current Household Social Needs (N=432)^a

	n (%)
Financial	
Problems paying bills, like electric, gas, water, or phone bills	169 (39.12)
Receiving medical or pharmacy bills you cannot afford	74 (17.13)
Getting cut off from or denied from programs that provide income support, like Cal Fresh (food stamps), CalWorks, etc	63 (14.58)
Having no health insurance	105 (24.31)
Housing	
Unstable housing including eviction, foreclosure, homelessness or staying with friends/family	168 (38.89)
Housing problems, like mold, insects rats or mice	128 (29.63)
Food	
Running out of food before having enough money or food stamps to buy more	156 (36.11)
Employment	
Difficulty finding a job	136 (31.48)
Problems with a current or former job, like unpaid wages, workers comp, discrimination or harassment	32 (7.41)
A disability interfering with the ability to work	48 (11.11)
Difficulty obtaining unemployment insurance	41 (9.49)
Transportation	
Difficulty affording transportation or ADA paratransit	136 (31.48)
Legal	
Other legal issues not mentioned above, including deportation concerns, child support or family law issues or violence	128 (29.63)
Other	
Having no primary care provider for your child or other household member (n = 367) ^b	61 (16.62)
Difficulty finding after-school activities or opportunities for you or your child	122 (28.24)
Difficulty finding childcare (n = 367) ^b	92 (25.07)
Bullying	48 (11.11)
Concerns about your or another adults' mental or behavioral health in your household	61 (14.12)
Household Level of Social Needs	
None	42 (9.72)
1-2	114 (26.39)
3-4	113 (26.16)
5 or more	163 (37.73)

^aReported needs are not mutually exclusive (participants reported up to 18 needs).

^bThis item was added after initial study initiation.

Table 3. Logistic Regression of Low Child Emotional Function on Household Social Needs, Maternal Perceived Stress, and Maternal Hair Cortisol (N=432)

	OR	Model 1 ^a (95% CI)	<i>p</i>	OR	Model 2 ^b (95% CI)	<i>p</i>
Household Social Needs (no=ref)						
Problems paying bills	1.21	(0.74, 1.96)	0.43	---	---	---
Medical or pharmacy bills you cannot afford	0.84	(0.45, 1.56)	0.59	---	---	---
Getting cut off from or denied income support	1.10	(0.56, 2.17)	0.76	---	---	---
Having no health insurance	0.96	(0.55, 1.67)	0.90	---	---	---
Unstable housing	0.80	(0.49, 1.30)	0.38	---	---	---
Housing problems (e.g., habitability)	1.29	(0.77, 2.16)	0.31	---	---	---
Running out of food	1.54	(0.94, 2.51)	0.08	---	---	---
Difficulty finding a job	1.08	(0.65, 1.79)	0.75	---	---	---
Problems with a current or former job	1.83	(0.76, 4.39)	0.17	---	---	---
Disability interfering with work	0.78	(0.35, 1.71)	0.54	---	---	---
Difficulty obtaining unemployment	1.95	(0.90, 4.24)	0.09	---	---	---
Difficulty affording transportation	1.29	(0.77, 2.17)	0.31	---	---	---
Other legal issues	1.21	(0.73, 2.02)	0.45	---	---	---
No PCP for child/household member (n = 367) ^c	1.48	(0.75, 2.91)	0.25	---	---	---
Difficulty finding after-school activities	2.09	(1.24, 3.52)	<0.01*	---	---	---
Difficulty finding childcare (n = 367) ^c	1.56	(0.85, 2.86)	0.14	---	---	---
Bullying	0.70	(0.32, 1.50)	0.36	---	---	---
Concerns about household adults' mental health	1.04	(0.52, 2.08)	0.90	---	---	---
Household Level of Social Needs						
None=ref	---	---	---	---	---	---
1-2 needs	---	---	---	0.95	(0.37, 2.39)	0.92
3-4 needs	---	---	---	0.90	(0.35, 2.28)	0.83
5 or more needs	---	---	---	1.49	(0.59, 3.72)	0.39

Maternal PSS-4 Score							
Low stress=ref	---	---	---	---	---	---	---
Moderate stress	---	---	---	1.98	(1.07, 3.64)	0.02*	
High stress	---	---	---	2.15	(1.14, 4.04)	0.01*	
Maternal Hair Cortisol							
Lowest tertile=ref	---	---	---	---	---	---	---
Middle tertile	---	---	---	0.77	(0.42, 1.38)	0.38	
Highest tertile	---	---	---	0.96	(0.54, 1.69)	0.90	

ref=reference group

All models included maternal PSS, maternal HCC and all covariates (results not all presented).

^aModel 1 included individual social needs as the social need variable; results reported are for 18 separate models of the outcome on each social need. Maternal perceived stress predicted emotional dysfunction across all above models (moderate: OR range 1.92-2.73; high: OR range 1.97-3.43; $p < 0.05$; not all shown). Maternal HCC not significant in any model.

^bModel 2 included level of social needs as the social need variable.

^cThis item was added after original study initiation; analyses for this item conducted on subjects with complete data only.

*Denotes significant findings at $p < 0.05$.

Table 4. Multinomial Logistic Regression of Child Hair Cortisol on Household Social Needs, Maternal Perceived Stress, and Maternal Hair Cortisol (N=312)

	Model 1 ^a			Model 2 ^b		
	Highest Tertile			Highest Tertile		
	RR	(95% CI)	<i>p</i>	RR	(95% CI)	<i>p</i>
Household Social Needs (no=ref)						
Problems paying bills	1.06	(0.49, 2.31)	0.86	---	---	---
Medical or pharmacy bills you cannot afford	0.94	(0.36, 2.42)	0.90	---	---	---
Getting cut off from or denied income support	0.51	(0.16, 1.58)	0.24	---	---	---
Having no health insurance	0.69	(0.28, 1.67)	0.41	---	---	---
Unstable housing	1.42	(0.67, 3.02)	0.35	---	---	---
Housing problems (e.g., habitability)	0.95	(0.42, 2.16)	0.91	---	---	---
Running out of food	0.53	(0.24, 1.16)	0.11	---	---	---
Difficulty finding a job	1.42	(0.65, 3.09)	0.37	---	---	---
Problems with a current or former job	0.76	(0.19, 3.05)	0.70	---	---	---
Disability interfering with work	1.51	(0.47, 4.86)	0.48	---	---	---
Difficulty obtaining unemployment	0.69	(0.21, 2.31)	0.55	---	---	---
Difficulty affording transportation	0.87	(0.37, 2.01)	0.74	---	---	---
Other legal issues	0.65	(0.29, 1.44)	0.29	---	---	---
No PCP for child/household member (n = 254) ^c	0.42	(0.12, 1.38)	0.15	---	---	---
Difficulty finding after-school activities	1.27	(0.57, 2.81)	0.54	---	---	---
Difficulty finding childcare (n = 254) ^c	1.32	(0.52, 3.34)	0.55	---	---	---
Bullying	0.90	(0.25, 3.20)	0.87	---	---	---
Concerns about household adults' mental health	0.95	(0.34, 2.66)	0.92	---	---	---
Household Level of Social Need						
None=ref	---	---	---	---	---	---
1-2 needs	---	---	---	0.52	(0.13, 2.07)	0.35
3-4 needs	---	---	---	1.08	(0.26, 4.39)	0.91

5 or more needs	---	---	---	0.44	(0.10, 1.78)	0.25
Maternal PSS-4 Score						
Low stress=ref	---	---	---	---	---	---
Moderate stress	---	---	---	0.66	(0.25, 1.72)	0.40
High stress	---	---	---	0.60	(0.22, 1.67)	0.33
Maternal Hair Cortisol						
Lowest tertile=ref	---	---	---	---	---	---
Middle tertile	---	---	---	1.52	(0.60, 3.83)	0.36
Highest tertile	---	---	---	10.60	(4.20, 26.74)	<0.01*

ref=reference group

All models included maternal PSS, maternal HCC and all covariates (results not all presented).

^aModel 1 included individual social needs as the social need variable; results reported are for 18 separate models of the outcome on each social need and only displayed for highest tertile of child HCC (compared to low). High maternal HCC predicted high child HCC across all above models (RR range 9.80-11.00; $p < 0.01$; not all shown). Maternal perceived stress not significant in any model.

^bModel 2 included level of social need as the social need variable; results only displayed for highest tertile of child HCC (compared to low).

^cThis item was added after original study initiation; analyses for this item conducted on subjects with complete data only.

**Denotes significant findings at $p < 0.05$.*

VII. Discussion

This dissertation research contributes to a growing body of evidence linking maternal stress and social needs to child emotional dysfunction. It begins to fill existing gaps in the literature around the physiologic impact of stress and social needs in Latinx populations and provides more evidence on the use of HCC as a measure of stress in Latinx children and mothers. Taken together, findings from the two studies can be used to inform clinical practice, health policy, and future research.

Implications for Clinical Practice

The high rates of maternal and child emotional dysfunction in our sample are especially concerning given low treatment rates for mental health concerns among the Latinx population.^{15,126} Early identification of emotional distress and stress is an important contributor to better health outcomes and could be achieved through improved screening and surveillance practices in clinical settings.^{250,251} Current primary care clinical practice guidelines recommend regular screening and surveillance for emotional conditions in children²⁵² and adults;²¹⁶ more recently guidelines have included recommendations for screening for social adversity.^{217,253-255} However, these guidelines do not consistently recommend that specific social needs (beyond income or education status) should prompt mental health screening or vice versa. Our findings of the strong associations between social needs and emotional problems suggest that integrated evaluation and intervention for both social needs and mental health symptoms in both medical and social services settings may provide opportunities to identify and intervene to improve both social and mental health outcomes for mothers and children, and particularly for Latinx youth and parents at risk for stress and emotional dysfunction.²⁵⁶

Primary care settings that serve both mothers and children may be especially well situated to provide integrated assessment and interventions related to emotional health and social needs; primary care clinical teams are a trusted source of care, provide frequent opportunities for assessment and follow-up, and often involve collaboration of community or specialty entities that offer a more holistic foundation of care for the individual.²⁵⁵⁻²⁵⁸ Although more research is needed to understand its true influence, lower acculturation appears to account for some of the effect in emotional problems for Latinx mothers in our analyses, suggesting that acculturation stress and/or cultural factors may play an important role in emotional resilience. Culturally-tailored, clinic-based mental health interventions for Latinx mothers that account for acculturation status, and include cultural protective components such as social support,^{16,219} should be considered as approaches to increase access to treatment or promote better outcomes.

Implications for Policy

The high levels of maternal and child emotional dysfunction and material deprivation in our sample highlight the intersectionality of social and emotional health. To improve emotional health – and the long-term consequences of poor emotional health – in the Latinx population will require clinical practice changes paired with upstream policies that strengthen economic supports for low-income Latinx communities. The COVID-19 pandemic has underscored the vulnerability of low-income Latinx mothers in the U.S. to economic and psychological strain, as many faced the intersection of the challenges associated with essential work, increased childcare burden, and/or income instability.²⁵⁹ Structural discrimination, poor access to quality education, and immigration documentation requirements contribute to predominantly low-wage jobs and other sources of economic hardship in this population²⁵⁹ and warrant further attention from public policy-makers. Policies that could address social needs in the Latinx community include greater

access to affordable food, housing, public transportation, and/or the provision of public aid or income subsidies during temporary periods of economic hardship.²⁶⁰ Additionally, increased access to health care for undocumented individuals or those without employer-based insurance could lead to earlier identification and treatment of mental health conditions, and/or provide access to a medical home,²⁶¹ where vulnerable individuals can be screened for social needs and connect with community supports.^{217,254}

Implications for Future Research

We found strong and significant associations between social needs and mothers' emotional dysfunction but did not find the same for their children. Future research, both quantitative and qualitative, is needed to more comprehensively explore the experiences of economically disadvantaged Latinx mothers and children, including how the intensity and duration of household social needs, country of origin, and family dynamics might influence the emotional impacts of material deprivation in children. Many families in our study reported having multiple social needs, many not described in previous literature, prompting the need for more evidence related to a wider group of social needs, beyond the most commonly studied - food and housing insecurity. Longitudinal studies are needed to explore the bidirectional relationship between social needs and emotional dysfunction, and may also help identify the risk and protective factors that may contribute to social risk in populations with mental health conditions.

As mentioned earlier, our findings in this predominantly Spanish-preferring group of mothers also highlight the need to research cultural factors, such as social support, that contribute to emotional resilience in Latinx families, and how these factors and their potential benefits evolve with greater acculturation. Importantly, such studies need to incorporate ethnicity and

geographic origin, to better understand the complex relationships between social needs and emotional health in sub-populations within the Latinx community.

Our sample had HCC values that were much higher than those previously reported in other studies, and there are not well-established reference ranges for cortisol as a measure of emotional distress in children or adults.^{134,138} Given the known limitations of survey-based mental health research, particularly for Latinx populations,²⁹ it would be helpful to develop more clarity about ways to use HCC and other stress biomarkers in order to have more objective measures for predicting, evaluating, and treating emotional dysfunction. Cortisol has been well-established as a key hormone in the physiologic stress response,^{38,135} yet there is still much to learn about how it can contribute to our understanding of stress and emotional function, particularly in ethnically diverse populations.¹³⁸ Larger population studies with greater representation of Latinx participants would improve our understanding of the use of biomarkers in stress research.

Limitations

Our study findings should be interpreted in the context of multiple limitations. While our sample size of Latinx participants was relatively large, the generalizability of results is restricted by our focus on low-income families seeking healthcare, willing to consent to an RCT, and with time to complete study activities. It is also important to consider that the high overall level of needs and emotional distress in our sample may also have limited our ability to detect statistically significant associations between the two. Similar to most other related work, our reliance on a cross-sectional study design of this baseline data analysis prohibits us from inferring directionality in associations. Material hardship and stress are factors that may benefit from longitudinal analyses to detect trends or fluctuations, as well as the potential for mediation

by maternal emotional health in the causal pathway between material hardship and child emotional dysfunction.

We used language as a measure of acculturation status. Using language as a proxy is supported in the literature but nonetheless provides a narrow scope to understand a complex concept. The Latinx population also is not monolithic. The generalizability of our findings would have been enhanced by more data on ethnicity or geographic origin, and their impact on beliefs or behaviors,^{194,222} that were not obtained in the original RCT but would have added more nuance to our analyses. Finally, our findings may also be subjected to unmeasured influence by other variables that are associated with emotional distress and stress (e.g. immigration status, acculturation stress, parenting style) but were not collected as part of the RCT.

Conclusion

This dissertation research contributes to a growing body of evidence linking social needs with maternal and child emotional dysfunction and stress, and adds new evidence on the use of HCC as a measure of stress in Latinx children and mothers. Our study findings have multiple implications for health policy, clinical practice, and research, and call for more robust investigations of the potential for social needs and mental health services integration for Latinx mothers and their children, as well as the cultural influences that might be leveraged to better address unmet needs for this group.

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