

## RESEARCH ARTICLE

# Maternal depression in Latinas and child socioemotional development: A systematic review

Rebeca Alvarado Harris<sup>1</sup>, Hudson P. Santos, Jr<sup>1,2\*</sup>

**1** School of Nursing, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, United States of America, **2** Institute for Environmental Health Solutions, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, United States of America

\* [hsantos@unc.edu](mailto:hsantos@unc.edu)**OPEN ACCESS**

**Citation:** Harris RA, Santos HP, Jr (2020) Maternal depression in Latinas and child socioemotional development: A systematic review. PLoS ONE 15 (3): e0230256. <https://doi.org/10.1371/journal.pone.0230256>

**Editor:** James Swain, Stony Brook University Health Sciences Center School of Medicine, UNITED STATES

**Received:** August 26, 2019

**Accepted:** February 25, 2020

**Published:** March 12, 2020

**Peer Review History:** PLOS recognizes the benefits of transparency in the peer review process; therefore, we enable the publication of all of the content of peer review and author responses alongside final, published articles. The editorial history of this article is available here: <https://doi.org/10.1371/journal.pone.0230256>

**Copyright:** © 2020 Harris, Santos. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

**Data Availability Statement:** All data is presented within the manuscript

**Funding:** The author received no specific funding for this work. HS academic effort was funded by

## Abstract

### Background

Although substantial research exists on the debilitating effects of maternal depression on child development, little is known about Latina mothers with depression and their young children within the broader context of sociocultural and economic stressors.

### Objectives

What is the relationship between maternal depression in Latina mothers and their children's socioemotional outcomes through early developmental windows (0–5 years)?

### Methods

We searched electronic databases PubMed, CINAHL, and PsycINFO in this systematic review, pre-registered via PROSPERO (CRD42019128686). Based on pre-determined criteria, we identified 56 studies and included 15 in the final sample. After extracting data, we assessed study quality with the National Heart, Lung, and Blood Institute Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.

### Results

We found inverse correlations between maternal depression and child socioemotional outcomes; furthermore, we found evidence of a moderating and mediating role of maternal depression between contextual stressors and child outcomes. Children of U.S.-born Latina mothers had poorer developmental outcomes than children of foreign-born Latina mothers across socioemotional domains and throughout early developmental windows.

### Conclusions

Future research must examine underlying mechanisms for the potential Latino paradox in young Latino children's socioemotional outcomes. Policies should support mental health of Latina mothers as early as the prenatal period.

National Institute of Nursing Research (1K23NR017898-01). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Competing interests:** The authors have declared that no competing interests exist.

## Introduction

Substantial research exists on maternal depression and childhood poverty and their debilitating effects on both maternal health and early child development. Although most of the research implicating the pathways by which maternal depression disrupts child development has been conducted on European-White descendent families [1], evidence suggests that the mother-child relationship is situated within the economic *and* sociocultural contexts in which families live [2]. As such, the intersection between maternal depression and poverty may affect children from ethnic minorities differently. Although Latino families are affected disproportionately by poverty [3], we found few research studies and no systematic reviews on the effect of maternal depression on child development within this vulnerable population. Latina mothers living in poverty experience numerous stressors related to both social adversity and ethnic minority status and are subsequently susceptible to depressive symptomology [4]. Prevalence rates of depression (mild to severe) in Latina mothers range from 12 to 59% in the perinatal period, compared to 10–15% in the general population [5]. Moreover, lack of accessible, affordable, and culturally competent mental health care for Latina mothers has been well-documented [6]. Little is known, however, about the extent to which mental health in Latinas is related to their children's socioemotional development. This is the first systematic review to consolidate studies examining the relationship between Latina mothers' depression and child socioemotional outcomes. Based on a social-ecological perspective, our review aims to study interpersonal and contextual pathways linking maternal depression in Latinas to a young child's (birth to five years old) socioemotional outcomes in the broader context of sociocultural and economic stressors (Fig 1).

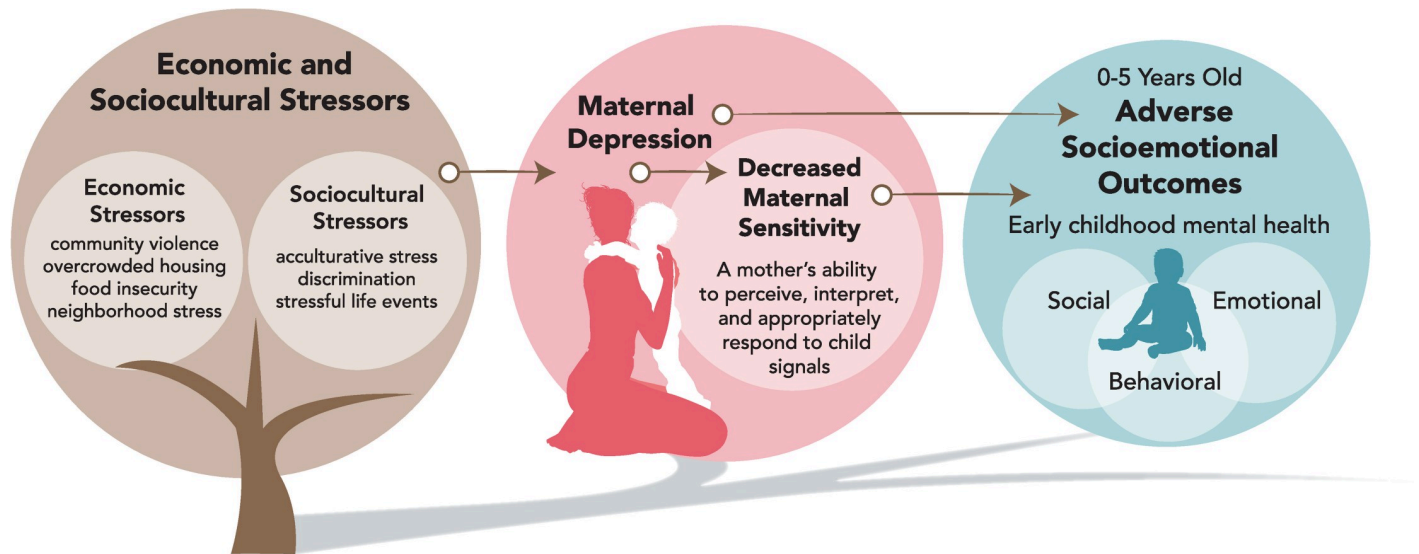
## Socioemotional outcomes

Socioemotional competencies underlie early childhood mental health and encompass “a child's developing capacity from birth through five years of age to form close and secure adult and peer relationships; experience, regulate, and express emotions in socially and culturally appropriate ways; and explore the environment and learn—all in the context of family, community, and culture.” [7] (p. 2). The relationship between maternal depression and disruptions in a young child's socioemotional development and related behavioral manifestations has been well replicated throughout infancy and early childhood [1,8].

Our review focuses on adverse early social and emotional outcomes associated with maternal depression and greater risk for psychopathology later in life [9]: 1) temperamental traits (e.g., higher negative emotionality and lower self-regulatory capacity) in infants that increase vulnerability to stressful caregiving environments; 2) infant social withdrawal behavior; 3) insecure mother-child attachment [10]; and 4) internalizing (e.g., fearfulness, anxiety) and externalizing (e.g., aggression) behaviors in toddlers and preschoolers [9]. We focus on maternal rather than paternal depression due to the high prevalence of maternal depression during sensitive developmental periods [11] and fetal exposure to prenatal depression during pregnancy.

## Maternal sensitivity

Prenatally, maternal depression may alter biochemical pathways associated with physiological and emotional regulation, thus, undermining the foundation on which children develop socioemotional competencies [12,13]. Adverse outcomes, however, may still be mitigated by nurturing mother-child interactions [14]. The early social and cultural caregiving environment continues to shape a young child's socioemotional developmental trajectory and, thereby, promotes future resiliency or exacerbates risk for mental health disorders over the life course [15].



**Fig 1. Potential pathways linking maternal depression in Latinas to child socioemotional outcomes.**

<https://doi.org/10.1371/journal.pone.0230256.g001>

The influence of maternal depression on parenting behaviors (e.g. maternal sensitivity) may underlie the relationship between maternal depression and child socioemotional maladjustment [16,17]. Mothers who are depressed may be less able to provide sensitive interactions needed to develop and sustain early socioemotional competencies, *especially* in the context of economic stressors [18,19].

Given that cultural beliefs and values influence parenting and subsequent child development [20,21], the interaction between maternal sensitivity and maternal mental health on young children's socioemotional outcomes may differ based on sociocultural context [2,22,23]. In fact, similar parenting behaviors often result in contradictory socioemotional child outcomes depending on the cultural meaning underlying the behavior [20]. The effects of maternal depression on maternal sensitivity and subsequent mother-child interactions are both a *modifiable* and *necessary* target for intervention [24]. Empirical evidence suggests that integrated interventions during the first five years of life to reduce maternal depression and enhance parenting skills may ultimately improve children's socioemotional developmental trajectories [16], particularly for the most vulnerable mother-child dyads [25]. However, culturally relevant interventions necessitate further research into the intersection of these variables and related child outcomes within the broader sociocultural and economic context.

### Economic and sociocultural stressors

The relationship between mother and child occurs within the context of poverty in >26% of Latino families with young children [26]. Poverty-related stressors, which have also been used as a proxy for poverty, encompass numerous risk factors for children: food insecurity, overcrowded housing, and community violence. In fact, meta-analyses within the general population have shown that poverty heightens the significant positive association between maternal depression and children's socioemotional difficulties [1,27]. Ethnic minority status also magnifies these effects, but understudied social and cultural pathways underlying such disparities have not been disentangled [1].

Theoretical frameworks such as the Family Stress Model (FSM) hypothesize that economic stressors engender parental stress and depression, compromising parental quality which could

otherwise serve as a child's protective buffer from poverty; as such, maternal psychological functioning may serve as a mediating mechanism by which poverty-related stressors predict child maladjustment [28]. The few FSM studies examining Latino children have focused primarily on middle childhood and adolescence and provide evidence for the mediating role of maternal depression between poverty-related stressors and socioemotional child outcomes [29,30] as well as revealing culture-specific ways in which these variables may interact [31,32]. However, not only do we know little about the validity of these models for Latino children during early childhood [33] but culture-specific stressors have rarely been used as anchors for these studies—despite the integral role of cultural influences on developmental processes [34,35].

Culture-specific stressors (e.g., discrimination, stressful life events, and acculturative stress) have predicted parental depression [36,37] and provide key sociocultural contexts in which to examine maternal and child health [38]. Acculturative stress, stemming from psychosocial adjustment to a host culture, may affect both immigrants and later generations who have simultaneously assimilated to a new culture and maintained cultural heritage [39]. In immigrant women, acculturative stress is often accompanied by family separation, social and linguistic isolation, and discrimination [40]—salient contributors of perinatal depression among Mexican-American mothers [41]. The cumulative effects of these stressors on the relationship between maternal mental health and the child's gestational and early childhood experiences may alter not only the child's life course but the physiology of subsequent generations via biological (e.g., epigenetic) mechanisms [38,42,43] and interpersonal (e.g., parenting) processes [42]. The Latino paradox, wherein less acculturated Latinos experience better health outcomes than more acculturated Latinos, has been documented for maternal and child health: birth weights [44] and breastfeeding rates [45]. However, investigators have not, to our knowledge, explored the relationship between maternal biopsychosocial functioning (e.g., depression) and early child socioemotional outcomes in the context of the Latino paradox.

### Current study

Although the Latino population comprises the largest ethnic minority group in the US [3], young Latino children remain an understudied population. For public policies to be effective, we need to know what harms and what protects children most profoundly amid the economic and sociocultural contexts in which their lives unfold. Research relevant to understanding Latina mothers and their young children may inform interventions that meaningfully support mothers struggling with depression, thereby potentially minimizing or even averting a developmental cascade that undermines critical socioemotional competencies formed early in life. Therefore, this systematic review addresses the following question: during the foundational years from the prenatal period to early childhood (0–5 years), how is maternal depression in Latina mothers related to their children's socioemotional outcomes?

### Methods

This systematic review is pre-registered via PROSPERO (CRD42019128686) and follows the guidelines recommended in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [46]. Ethical approval was not required because data was synthesized from previously published studies.

### Study inclusion criteria

We screened studies for eligibility based on predetermined inclusion criteria per the study protocol. To be considered for inclusion, the study needed to assess the relationship between

maternal depressive symptoms and children's socioemotional outcomes within Latina mother-child dyads living in the US. We used the term "Latina" to refer to a female of Latin American origin or descent (e.g., Mexico, Cuba, Puerto Rico, South and Central America), regardless of race. Maternal depression could encompass depressive symptoms on a continuum, elevated scores on self-report measures, or clinical diagnosis of a depressive disorder. We did not exclude for co-morbid symptoms or diagnoses such as anxiety, stress, or another form of psychological distress. Self-report depression measures (e.g. CES-D) often used in population-based studies may more broadly capture psychological distress and diverse affective symptoms (e.g. anxiety) rather than symptoms specific to a depressive disorder [18,47,48]. We defined socioemotional development as a child's emerging capacity for the emotional, behavioral, and social competencies underlying early childhood mental health [9]. Further inclusion criteria were a) young children exposed to maternal depression at any point prenatally up until age five, allowing us to focus on foundational sensitive early developmental periods; b) adult mothers  $\geq 18$  years old; and c) specified maternal economic status. Studies of subpopulations with confounding secondary diseases or conditions altering maternal depressive symptoms or socioemotional outcomes (e.g., cancer, natural disasters, or developmental delays) were excluded. There were no time restrictions applied to ensure comprehensive results; we completed the search in October 2018. Studies could be in English or Spanish.

### Search strategy

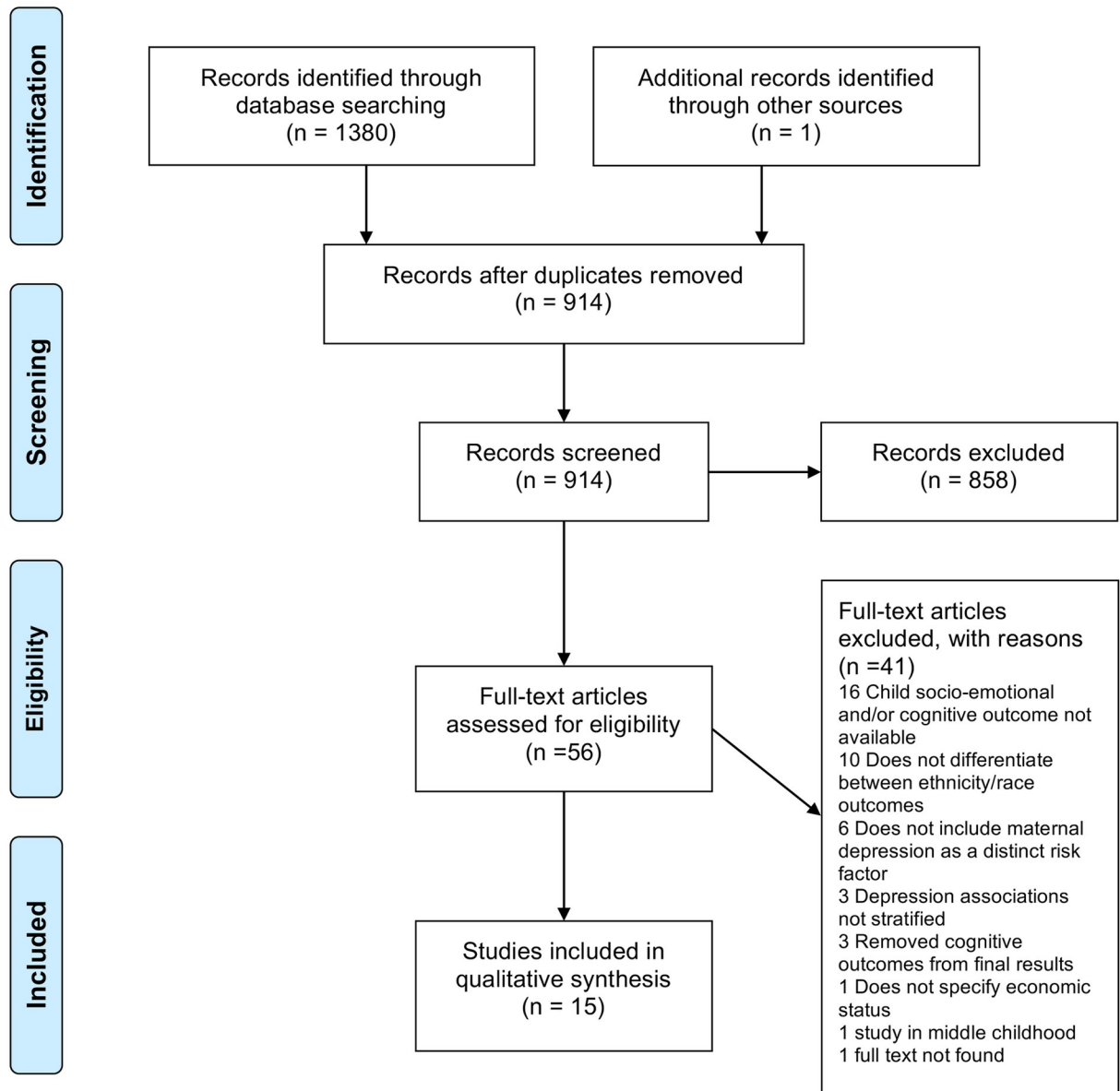
We identified studies through manual searches and through PubMed, CINAHL, and PsycINFO. We applied a comprehensive search string to all three databases to capture studies examining the impact of maternal depression on young children's socioemotional and cognitive outcomes in the Latino population: (Postpartum OR Depression OR Depressive Disorder OR Depress\*) AND (Postpartum Period OR Postnatal Care OR Prepartum OR pre-partum OR prenatal OR pre-natal OR antenatal OR perinatal OR peripartum OR postpartum OR post-partum OR postnatal OR post-natal OR puerperium OR parturition OR pregnanc\* OR pregnant or mother\* OR newborn\*) AND (Hispanic Americans OR Latina\* OR Latino\* OR Hispanic\*) AND (child\* OR infant OR toddler OR preschooler OR pediatric) AND (develop\* OR behavior\* OR cognitive OR emotion\* OR conduct OR language OR temperament OR socio\* OR regulation OR internalizing OR externalizing OR psych\*). We manually searched reference lists from relevant literature for any additional eligible studies.

### Study selection and data extraction

We selected studies using the four-phase process for systematic reviews recommended by the PRISMA Group [46] (Fig 2). From the electronic database search, we identified 914 studies after removing 466 duplicates. We screened titles and abstracts from identified studies for eligibility and excluded 858 studies not meeting inclusion criteria. We retrieved the full text of the 56 remaining to determine eligibility, and recorded reasons for exclusion for the 38 non-eligible studies. In the final phase, 17 studies from the database search and one study from the manual search met all eligibility criteria and were selected for data extraction. Data from included literature was extracted onto a template which included study purpose, first author, publication year, study design, sample characteristics, maternal depression measures and data collection points, socioemotional or cognitive outcome measures and data collection points, main analytical approach and covariates, and main results. When available, country of origin and acculturation data was extracted. A second reviewer evaluated the extracted data for thoroughness. During the extraction phase, two studies did not include maternal age ranges, and three studies included broad maternal age ranges that extended into adolescence. Reviewers



### PRISMA 2009 Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).

Fig 2. PRISMA flow chart diagram.

<https://doi.org/10.1371/journal.pone.0230256.g002>



agreed to include these studies; the broad age range would provide a representative sample of Latina mothers in the United States. We contacted authors for maternal age distribution if needed. Moreover, we included three dissertations meeting inclusion criteria.

We extracted data for cognitive outcomes because they are interwoven with developing socioemotional competencies early in life [9]. However, these were excluded from our final qualitative synthesis and placed in a supplemental table in order to focus our attention on early social and emotional outcomes (S1 Table).

## Quality assessment

Study quality (Table 1) was assessed by two reviewers following the guidelines established in the National Heart, Lung, and Blood Institute (NHLBI) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies [49].

## Results

### Study characteristics

In this systematic review, we had a final sample of 15 studies examining Latina maternal depression in relation to child socioemotional development (Table 2). Study samples ranged from 26 to 1,600 mother-child participants per study (totaling 5,656 dyads). Participants in most studies ( $n = 14$ ) came from low-income backgrounds, except one study using data from the Early Childhood Longitudinal Study–Birth Cohort (ECLS-B)—a nationally representative cohort of children born in 2001. Income levels for participants in the ECLS-B ranged from  $\leq 20,000$  to  $\geq 75,000$ . Country of origin was reported in seven studies; six studies had mostly Mexican descent participants while one study was predominantly represented by participants of Puerto Rican descent [50]. Five studies employed samples from Head Start programs, which serves low-income families. Twelve of 15 studies were completed within the past ten years, and nine of those studies were published within the past five years.

Study designs included five cross-sectional studies and 10 longitudinal studies. Most studies measured child socioemotional outcomes through mother-reported scales, such as a) Child Behavior Checklist for ages 1 ½ to five (CBCL,  $n = 8$ ), which measures internalizing and externalizing behavioral functioning [51]; and b) Infant Behavior Questionnaire (IBQ-R,  $n = 2$ ) which assesses infant's regulatory capacity, negative affect, and extraversion [52]. Maternal depressive symptomology was measured by self-reported symptoms in all but one study, which used the DSM-IV diagnostic criteria for Major depressive disorder [53]. The most prevalent measure was the Center for Epidemiologic Studies-Depression Scale (CES-D,  $n = 9$ ), which measures depression symptoms within the past week. Maternal acculturation was measured in nine studies, mostly through nativity ( $n = 6$ ). Two studies measured maternal sensitivity: a mother's ability to perceive, interpret, and appropriately respond to child signals [54]. Measures of maternal sensitivity included The Three Bag Task or Two Bag Task [55], in which the dyad is asked to play with three toys during a 15-minute video-recorded session; trained coders later assess parent behavior.

### Data synthesis

We grouped key findings from selected studies into three categories based on individual, interpersonal, and contextual pathways linking maternal depression to child development (Fig 3): 1) child's socioemotional outcomes in relation to chronological developmental windows and the course and timing of maternal depression (prenatal, infancy, toddlerhood, preschool, and infancy through early childhood); 2) associations between maternal depression and maternal

Table 1. Quality assessment tool for observational cohort and cross-sectional studies.

	Aisenberg, (2001)	Burtchen et al., (2013)	De Leon Siantz et al., (2010)	Doudna, (2016)	Fuller et al., (2018)	Huang et al., (2012)	La Roche et al., (1995)	Luecken et al., (2015)	Lequerica et al., (1995)	Martinez (2014)	Mennen et al., (2015)	Palermo et al., (2018)	Somers et al., (2018)	Waters et al., (2015)	Westbrook & Harden, (2010)	
Was the research question or objective clearly stated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was the study population clearly specified and defined?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was the participation rate of eligible persons at least 50%?	N	NR	NR	N	NR	Y	Y	Y	Y	Y	Y	NR	NR	NR	Y	Y
Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was a sample size justification, power description, or variance and effect estimates provided?	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N
For the analyses in this paper, were the exposure (s) of interest measured prior to the outcome(s) being measured?	N	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	N	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?	Y	Y	Y	Y	N	Y	N	N	N	Y	N	N	Y	Y	Y	Y
Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was the exposure(s) assessed more than once over time?	N	N	N	N	N	Y	Y	Y	N	N	Y	N	Y	Y	N	N
Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Were the outcome assessors blinded to the exposure status of participants?	NR	NR	NR	NR	NR	NR	Y	NR	N	NR	NR	NR	NR	NR	NR	NR
Was loss to follow-up after baseline 20% or less?	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N	N	N	N	N	Y
Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	N	N	Y	N	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y

Y = Yes, N = No, NR = Not reported

<https://doi.org/10.1371/journal.pone.0230256.t001>



**Table 2. Summary of studies included in the review (n = 15, sample size = 5,656).**

Study	Purpose	Study Design	Sample/Setting	Measure of Maternal Depression and data collection points	Measure of Socio-emotional outcome and data collection points	Country of origin and any acculturation data	Analysis and covariates	Results
Burtchen et al., (2013)	To examine the relationship between maternal major depression and infant social withdrawal behavior	Cross-sectional: infant's 6-month primary care visit Exposure to clinical depression: (mean = 4 months prenatal, 6 months postnatal)	n = 155 (93%) Low-income predominantly (87%) Latina mother-child dyads from a subsample of a research project examining perinatal mood disorders and infant development Maternal age: > 18 M = 28 SD = 6.2 6-month old full-term infants with no medical disorder or physical complaints at primary care routine visits	Prenatal and Infancy		Country of origin not reported maternal time in U.S. (M = 8.2 years)	Analysis: chi-square test or independent samples t test Covariates: potential confounding variables (i.e. maternal age, mode of delivery, number of children, child gender, tobacco, alcohol, and drug use) measured and deemed non-confounding	Infants with mothers diagnosed with major depression scored significantly higher on infant withdrawal behaviors than infants of mothers without depression, (6.1 vs 3.34, p ≤ .001) Infants with depressed mothers scored significantly higher on intrapersonal and interpersonal social withdrawal behaviors: facial expression, vocalizations, relationship, attraction, eye contact, and self-stimulation Significantly negatively correlated with maternal major depression: parents living together, father involved in childcare, emotional support, food security
				DSM-IV diagnostic criteria for Major Depression Disorder at 6 months after delivery: standardized psychiatric interview by a board-certified bilingual psychiatrist	Infant social withdrawal behavior at 6-months: ADDBB (scale modified with author's permission)			
Fuller et al., (2018)	To examine the relationship between prenatal maternal hardship with infant temperament at 10 months prenatal depression used as a moderator	Longitudinal: 28-32-weeks gestation and 10 months of age	n = 412 Low-income Hispanic pregnant mothers enrolled in an obesity prevention program (Starting Early) uncomplicated singleton pregnancies at primary care clinics Maternal age: > 18	PHQ-9 prenatally: 28-32-week gestation	Infant temperament (orienting/regulatory capacity, negative effect, surgency / extraversion) at 10 months: IBQ, Very Short Form	U.S. or foreign-born mothers Country of origin not reported U.S. born mothers had higher negativity ratings (p = .01) unrelated to depressive symptoms	Analysis: linear regression Covariates: marital status, immigration status, education, parity, infant sex, infant birth weight, intervention group, prenatal depression (used as either covariate or moderator), PPD at 3 months	Prenatal depressive symptoms significantly moderated the relationship between neighborhood stress and orienting/regulatory capacity scores. (standardized β = -0.28, β = -0.86, SE, 0.26; 95% CI, -1.37 to -0.34)
Luecken et al., (2015)	(1) Examine the relationship between prenatal maternal depressive symptoms and infant temperamental negativity as predictors of infant cortisol response (2) Explore the interaction between maternal depressive symptoms and infant negativity	Longitudinal: (26 to 38-week gestation), 6 and 12 weeks postpartum	n = 322 Mexican-American low-income (below \$25,000) mother-infant dyads with healthy singleton pregnancies at hospital-based prenatal clinic Maternal age: M = 27.8 SD = 6.5 18-42	10-item EPDS ≥ 13 prenatally (26 to 38-week gestation)	Infant temperament negativity at 6 weeks: infant negativity subscale of IBQ-R	86% born in Mexico; 14% U.S. born; 82% mostly Spanish speaking	Analysis: regression Analyses (not specified) Covariates: time of day, postpartum: maternal AUCg, depressive symptoms, mood	Higher prenatal maternal depressive symptoms correlated with elevated cortisol measures for 12-week old infants with high temperamental negativity but lower cortisol for infants with low negativity. (unstandardized estimate for the interaction = .019, SE = .007, 95% CI [.005, .033], p = .008).
				9 and 12 weeks postpartum	Infant dysregulation: saliva cortisol at 12 weeks: AUCg—prior to task (T0), at 0 (T1), 20 minutes after task (T2), and 40 (T3) minutes after task complete	Acculturation measured (as potential covariate) by ARSMA II. Mexican-born mothers reported decreased infant negativity compared to U.S.-born mothers (p < .01), significantly unrelated to other measured variables in study	Models analyzed with and without covariates The effect of low social support followed a similar trend. Neither low prenatal depressive symptoms nor high prenatal social support predicted infant cortisol outcomes. Bi-directionally, higher infant negativity at 6 weeks predicted increased maternal depressive symptoms at 12 weeks (unstandardized β = 1.12, t (297) = 3.29, p = .001; model R <sup>2</sup> = .18).	

Toddlerhood

(Continued)

Table 2. (Continued)

Study	Purpose	Study Design	Sample/Setting	Measure of Maternal Depression and data collection points	Measure of Socio-emotional outcome and data collection points	Country of origin and any acculturation data	Analysis and covariates	Results
Huang et al., (2012)	To examine the relationship between maternal depression, maternal sensitivity and child attachment	Longitudinal: 9 and 24 months of age	n = 1600 Mother-child dyads from the Early Childhood Longitudinal Study-Birth Cohort Maternal Age, U.S.-born: M = 26 15-40+ Maternal age, foreign-born: M = 27.8 15-40+ Child age at Time 1: 9 months Child age at Time 2: 24 months	Modified CES-D at 9 months CIDI Short Form at 24 months Maternal sensitivity at 24 months: Two Bag Task	Child attachment measured at 24 months: TAS-45	Country of origin not reported U.S. Born Hispanic: n = 750 Foreign Born Hispanic: n = 850 Compared with U.S. born Hispanic women, foreign-born mothers are significantly less likely to have an insecurely attached child (OR = .69, 95% CI = .51-.95, p = .02).	Analysis: logistic regression and ANOVA Covariates: household income, maternal education, childcare arrangement	Chronic maternal depressive symptoms in Hispanic mothers posed the highest odds ratio for child insecure attachment (OR = 8.12, 95% CI = 1.07-61.68, p = .04). "Maternal sensitivity" did not significantly mediate the relationship between maternal depression and insecure attachment (OR = .85, 95% CI = .71-1.03, p = .10). The most common depressive pattern in Hispanic women, later onset at 24 months, predicted the least likelihood for insecure attachment at 24 months (OR = .32, 95% CI = .12-.88, p = .03).
Martinez, (2014)	To examine the relationship between maternal depression and child behaviors (aggression, compliance, and negative emotionality)	Longitudinal: Baseline and 6-month follow up	n = 47 Latinas with limited English proficiency, low-income and a positive depression screen; mother-child dyads from a larger Interpersonal Psychotherapy study enrolled in Early Head Start programs Maternal age: M = 27.13 SD = 5.6 Child age: M = 23.1 months SD = 8.7	CES-D ≥ 16 at baseline	Child behavior (aggression, compliance, and negative emotionality) at baseline and at 6-month follow-up: CBCL and ITSEA-R	Country of origin not reported Years in U.S.: M = 5.3 years, SD = 5.9 Acculturation: SASH	Analysis: descriptive statistics, zero-order correlations, and hierarchical multiple regression analyses Covariates: child gender, child age, treatment condition, and child behavior at baseline	Maternal depressive symptoms at baseline significantly predicted child negative emotionality 6 months later: F(5, 23) = 3.56, p < .05, R2 = .44, R2Δ = .09, p < .10] Severity of maternal depressive symptoms x child negative emotionality at baseline improved models predicting child negative emotionality 6 months later: F(5, 22) = 4.10, p < .01, R2 = .53, R2Δ = .09, p = .051 Maternal depressive symptoms significantly moderated the relationship between negative emotionality at baseline and at 6-month follow-up: (B = -.02, p < .05) Depression severity significantly moderated these associations: Low: t(22) = 3.74, p = .001 Average: t(22) = 3.47, p = .002 High: t(22) = 1.58, n.s. Child aggression and compliance were not significantly associated with maternal depression
Aisenberg, (2001)	To examine the psychological and behavioral effects of exposure to community violence	Cross-Sectional: maternal and child measures at study entry	n = 31 Low-income Latina mother-child dyads enrolled in a Head Start program Maternal age: M = 28.74 SD = 4.77 21-43 Child age: 48-58 months M = 53.22 SD = 2.16	"Maternal Distress Symptomology" at study entry: Adult PTSD: IES-R Depression and anxiety: BS ≥ 65	Child behavioral functioning measured at study entry: CBCL	80.6%: Born in Mexico 6.1%: Born in El Salvador 12.9%: U.S.-born mothers	Analysis: Univariate t tests without correction for multiple comparisons and bivariate correlations, multiple regressions Covariates: none reported	Maternal distress symptomatology did not moderate relationship between exposure to community violence and CBCL scores Maternal distress symptomatology significantly mediated the relationship between exposure to community violence and CBCL scores, β = .45, p < .05. Proportion of children with behavior problems based on CBCL ≥ 60: 30%.

(Continued)

Table 2. (Continued)

Study	Purpose	Study Design	Sample/Setting	Measure of Maternal Depression and data collection points	Measure of Socio-emotional outcome and data collection points	Country of origin and any acculturation data	Analysis and covariates	Results
De Leon Siantz et al., (2010)	To examine the relationship between maternal functioning and child behavior problems	Cross-Sectional Prospective Design: maternal and child measures at study entry	n = 205 Latino children from "Migrant Head Start Programs", Maternal age: M = 32 SD = 7.43 19–67 Child age: 36–72 months M = 51 SD = 6.24	"Maternal Functioning" at study entry: Depression: CES-D ≥ 16; Maternal stress: FILE Parenting Style: PARQ	Child behavioral functioning measured at study entry: CBCL	Acculturation measured by: HHANES and language preference 35.9% born in U.S., 61.4% born in Mexico	Analysis: step-wise regressions Covariate: Maternal years in U.S. How long child has been in Head Start could be confounding variable but not addressed	Internalizing problems significantly predicted by both maternal stress and depressive symptoms in both genders: (β = .295, R <sup>2</sup> = .164, df = 2,145, F = 15.99, p = .000) Maternal stress and depressive symptoms more likely to predict behavior problems in girls while maternal stress and harsher parenting style more likely to predict behavior problems in boys Proportion of children with behavior problems based on CBCL 12%
Doudna, (2016)	To examine the relationship between household food insecurity, parenting alliance, and maternal depressive symptoms on child socioemotional outcomes within Latino families in rural America using the Family Stress Model	Cross-sectional: maternal and child measures at study entry	n = 99 Low-income Latina mothers living in rural communities enrolled in "Rural Families Speak about Health" project Maternal age: >18 M = 32.36 SD = 7.87 Child age: 18–71 months	CES-D, short form ≥ 10 at study entry	Child behavioral functioning measured at study entry: CBCL	Not reported	Analysis: path analysis Covariate: financial distress measured by PFQW No other potential confounding variables such as wide age range measured	Depressive symptoms were negatively associated with parenting alliance (β = -2.7, p = .12) Maternal Depressive symptoms did not significantly mediate the relationship between household food insecurity and child behavioral functioning
La Roche et al., (1995)	To examine the relationship between toddlers' behavioral difficulties, mothers' depression, self-efficacy, and social support	Longitudinal: Baseline and 3-month follow-up	n = 26 Low SES, Spanish-speaking Latina mother-child dyads attending a behavioral group health center Maternal age: M = 26.7 years 21–36 Child age: M = 34 months 24–60	At baseline and 3-month follow-up: Social Support: Norbeck Social Support Network Scale Depression: CES-D ≥ 16 Self-Efficacy: The Maternal Efficacy Questionnaire adapted for toddlers	Preschool Behavioral Checklist completed by both bilingual psychologists and mothers at baseline (independent variable) and 3-month follow-up (dependent variable)	Country of origin and acculturation data not reported	Analysis: Pearson correlations, multiple regression analyses Covariates: none reported	Significant relationship between perceived social support at baseline and maternal depressive symptoms at 3-month follow-up, r = -.46 (p < 0.05), -.51 (p < .05) Maternal depressive symptoms at time one were not significantly associated with their toddlers' behavioral difficulties at 3-month follow-up.
Lequerica Et. al. (1995)	To examine mothers' concerns about their children's behaviors at home in relation to stressful family life events, maternal depression, methods of discipline, and demographic factors	Cross-sectional: maternal and child measures during outpatient pediatric clinic visit	n = 52 Low-income mother-child dyads seeking services at a pediatric outpatient clinic Maternal age: Not reported Child age: 24–36 months: 32.7% 36–48: 38.5% 48–60: 28.8%	At study entry: Depression: subscale of Ilfeld's Psychiatric Symptom Index Stressful life events: Social Readjustment Rating Scale by Holmes and Rahe,—shortened version	Child behavioral functioning measured at study entry: CBCL (shortened version with 65 questions)	Country of origin: Puerto Rico: 55.8% Santo Domingo/Central America: 34.6% South America: 9.6% Acculturation data not reported	Analysis: Pearson correlations, chi squares, and analysis of variance Covariate: none reported	CBCL scores were not significantly related to family life stressful events or maternal depressive symptoms. CBCL questions with higher frequencies than normal or psychiatrically-referred non-Latino children: Clings to adults: 80% of 4 to 5 year olds compared to 32% in Achenbach's normal Unable to sit still/hyperactive: 90% of 4 to 5 year olds compared to 40% in Achenbach's normal

(Continued)

Table 2. (Continued)

Study	Purpose	Study Design	Sample/Setting	Measure of Maternal Depression and data collection points	Measure of Socio-emotional outcome and data collection points	Country of origin and any acculturation data	Analysis and covariates	Results
Mennen et al., (2015)	To examine the relationship between clinical maternal depression and children's progress during mental health treatment	Longitudinal: at study entry and at 6-month intervals up to 3 years	n = 147 Low-income predominantly Latina (94%) mother-child dyads  Child in or at high risk for child welfare services, diagnosed with emotional, behavioral or mental disorder, and enrolled in an inner-city mental health treatment program (Project ABC)  Maternal age: M = 30 SD = 6.6  Child age: M = 34 months SD = 14.8, 58% boys	CES-D ≥ 16 at study entry and at 6-month intervals up to 3 years	Child behavioral functioning measured at study entry and at 6-month intervals up to three children ages 1.5–5  Adaptive functioning measured at study entry and at 6-month intervals for up to three years: Vineland Screener	Country of origin and acculturation data not reported	Analysis: univariate statistics, growth curve modeling  Covariates: child sex and child welfare involvement  Study did not adjust for maternal depression, a potential confounding variable given self-reported child functioning measures	Significant associations between maternal depressive symptoms and child behavior problems at entry: higher internalizing scores (17.70 vs 14.23, p = .018), higher externalizing scores (24.65 vs 21.45, p = .044), higher total CBCL scores (65.09 vs 52.99, p = .006), and lower socialization scores, (95.58 vs 103.36, p = .022)  Children's CBCL scores improved more slowly when their mother was depressed: Internalizing = 1.59, p < .05; Externalizing = 17.75, p < .05; Total = 4.66, p < .05); daily living skills: time-by-depression interaction coefficient = 2.99, p < .05).  Children of mothers with higher depressive symptoms: finished treatment with lower levels of behavioral functioning, received more services (96.3 vs. 61.4, F = 4.18, p = .043), and remained in treatment for longer (435 vs. 257 days, F = 4.41, p = .039)  No significant associations with maternal depressive symptoms on child's communication, daily living skills, and motor skills
Palermo et al., (2018)	To examine the relationship between economic hardship during infancy, "maternal mental health problems", "maternal positive parenting behaviors", and Latino children's socio-behavioral difficulties and academic skills prior to kindergarten entry- using a culturally integrated Family Stress Model; do acculturation levels moderate the pattern of associations?	Longitudinal: children at 4, 14, 24 and 36 months, and half a year before kindergarten	n = 714 Early Head Start Research and Evaluation Project (EHSREP) Low-income Latina mothers  Maternal age: 84.6% ≥ 18 M = 24 SD = 6 13–43  Child age at study entry: M = 4 months	At 14 months, "maternal mental health problems" quantified by Depression: CES-D, Parenting Stress: PSI-SF, Perceived Control; Pearlin Mastery Scale	Both measures within half a year before kindergarten: -Socio-behavioral health problems (SBHP): Problem Behavior scale  Subscales: aggressive behavioral scale, hyperactive behavior scale  Maternal sensitivity at 14 months: Three Bag Task	82% Mexican-American; 9% Central American; 6% Puerto Rican  At 24 months old, mother's acculturation levels measured by generational status, English use preference, and proficiency: Multi-cultural Acculturation Scale, Picture Vocabulary subscale of the Woodcock-Johnson Achievement III  Positive association between maternal acculturation and positive parenting behaviors (β = .22, SE = .06, p < .001)	Analysis: Structural equation modeling  Covariates: - child's gender, maternal education, family structure -At 14 months: hyperactivity measured by 1 item from the Bayley Scales of Infant Development II	Positive association between economic hardship and maternal mental health problems (β = .50, SE = .08, p < .001)  Negative association between maternal mental health problems and maternal positive parenting behaviors (β = -.16, SE = .06, p = .008)  Maternal mental health problems and maternal positive behaviors did not significantly mediate the association between economic hardship and children's socio-behavioral problems (β = -.02, SE = .01, p = .061)  Maternal positive parenting behaviors significantly mediated the association between maternal mental health problems and social behavioral problems (β = .03, SE = .02, p = .047)  Relationship patterns did not vary by acculturation levels

(Continued)

Table 2. (Continued)

Study	Purpose	Study Design	Sample/Setting	Measure of Maternal Depression and data collection points	Measure of Socio-emotional outcome and data collection points	Country of origin and any acculturation data	Analysis and covariates	Results
Westbrook & Harden, (2010)	To examine the relationship of proximal risk factors (family structure and maternal depression) and distal risk factors (community violence) on parenting style and subsequent preschool children's socioemotional outcomes in an ethnically and racially stratified sample using the Family Stress Model	Longitudinal: Data Analysis from the FACES 2000 cohort from Fall 2000 (Time 1) to Spring 2001 (Time 2) for families with children aged 3–4 years old	n = 425 FACES 2000 (The Family and Child Experiences) study cohort derived from a nationally representative sample of Head Start programs intended to measure program quality through socioemotional and academic outcomes Maternal age: > 18 M not provided Child age: M = 48.3 months SD = 6.4 at baseline (Time 1)	Modified CES-D used to measure depressive symptomatology at baseline (Time 1)	Measured at Fall 2000 and Spring 2001: Social skills measured by selected items from the Personal Maturity Scale and the Social Skills Rating System Behavior Problems measured by selected items on Personal Maturity Scale, CBCL, Teacher Report and the Behavior Problems Index	Country of origin and acculturation data not reported	Analysis: structural equation model Covariates: maternal age, maternal education, family poverty status, child age, child gender, baseline social-emotional functioning	No significant direct associations between individual study variables (violence exposure, family structure, maternal depression, parenting style) on child socio-emotional outcomes  Cumulative effect of variables explained 36% of the European-American model and 22% of the Latino model
<b>Infancy through Early Childhood</b>								
Somers et al., (2018)	(1) To examine the relationship between postpartum maternal depression and children's biological sensitivity to behavior problems via children's dysregulation and (2) To explore sex differences in behavior problems due to PPD	Longitudinal: Every 3 weeks postpartum from 6 to 24 weeks, at 24 months, and at 36 months	n = 322 Low-income Mexican-American mother-child dyads from a larger study (Las Madres Nuevas) A healthy singleton infant Maternal age: > 18 M = 27.8 SD = 6.5	10-item EPDS every 3 weeks from 6 weeks to 6 months ≥ 13  CES-D at 36 months (as covariate) ≥ 16	Child dysregulation at 24 months: validated dysregulation coding system  Child Behavior Problems at 36 months: 113-item CBCL	86% born in Mexico; 13.7% born in U.S.  Children of U.S.-born mothers: -higher RSA, p = .003 -more behavior problems, p = .001 country of birth predicted behavior problems (B = -14.350, SE(B) = 4.712, p = 0.002 CI (-23.59, -5.12)	Analysis: structural equation model Covariates: maternal country of origin, maternal age, number of biological children, and concurrent depressive symptoms	Total child behavior problems were significantly predicted by PPD symptoms x infant RSA: (B = -0.221, SE(B) = 0.069, p = 0.001)  Low infant RSA x PPD symptoms conferred the most susceptibility (B = 0.190, SE(B) = 0.097, p = 0.05)  PPD symptoms x infant RSA predicted: -internalizing behavior problems: (B = -0.083, SE (B) = 0.022, p ≤ .001) -externalizing behavior problems, (B = -0.068, SE (B) = 0.025, p = 0.006)  Higher maternal 36 month depressive symptoms associations: -lower infant RSA, r = -0.177, p = 0.22 -greater PPD symptoms, r = .349, p ≤ .001 -more behavior problems, r = 0.482, p ≤ .001  Higher depressive symptomology = more significant effect on child behavior problems  Child dysregulation was not significantly predicted by any of the study variables  No significant sex differences

(Continued)

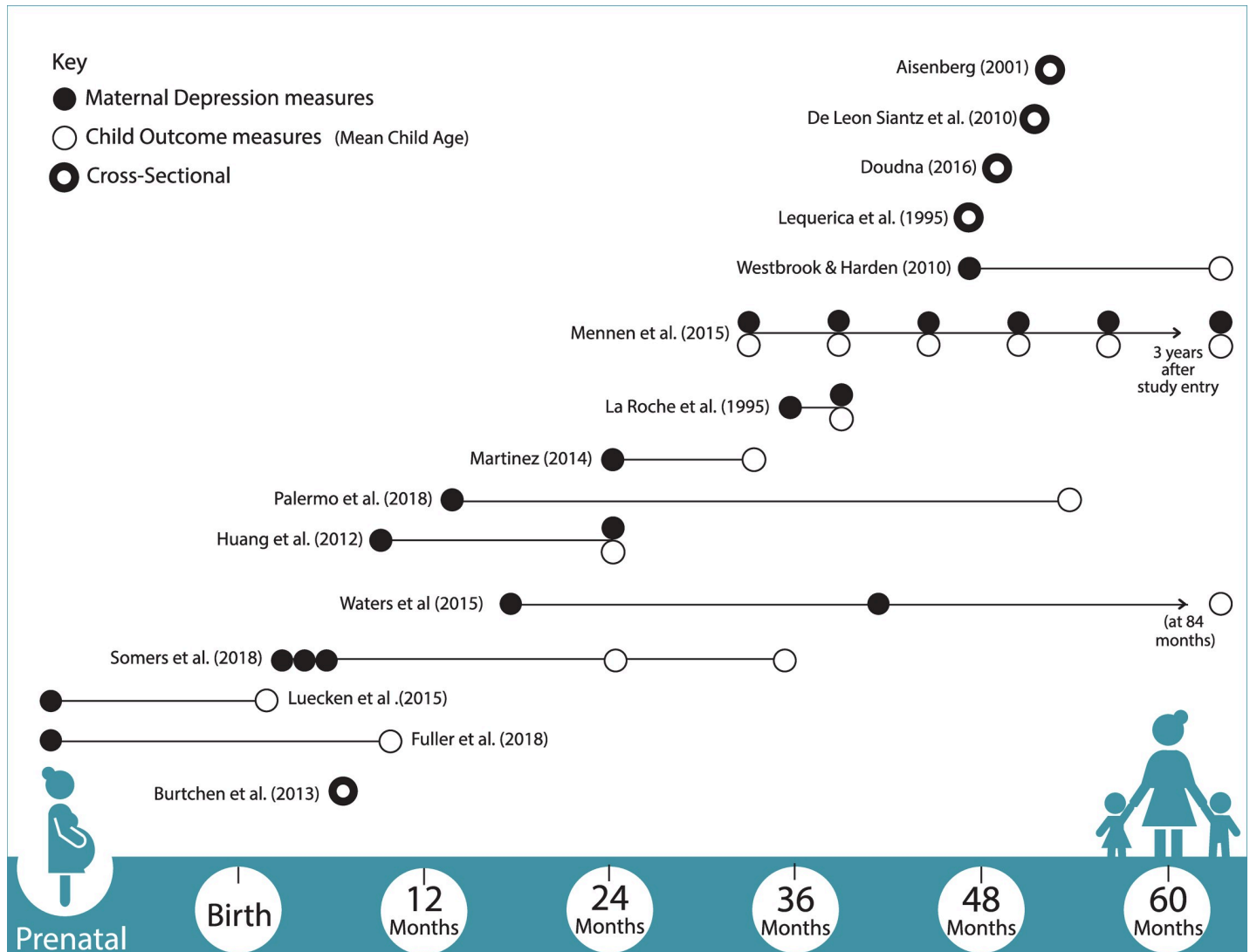
Table 2. (Continued)

Study	Purpose	Study Design	Sample/Setting	Measure of Maternal Depression and data collection points	Measure of Socio-emotional outcome and data collection points	Country of origin and any acculturation data	Analysis and covariates	Results
Waters et al., (2015)	Does chronic maternal overcrowding moderate the relationship between ANS (automatic nervous system) reactivity at 6 months and externalizing behaviors at 7 years old?	Longitudinal: 6 months, 1 year, 3.5 years, and 7 years of age	n = 99 The Center for the Health Assessment of Mothers and Children of Salinas birth cohort (CHAMACOS)  Mexican-American low-income mother-child dyads Maternal age: M = 26.49 SD = 4.75 18–42	CES-D ≥ 16 at 1-year old and 3.5-year old visits	Child externalizing problems at 7-years old: BASC-2	92% women born in Mexico, 94% only/mostly Spanish speaking	Analysis: multiple linear regression Covariates: child sex, maternal years in the U.S.	In children with low resting sinus arrhythmia (RSA) reactivity, chronic maternal depressive symptoms predicted highest levels of externalizing difficulties at 7 years, t (74) 5.3,98, p < .001, 95% CI [10.04, 30.17].  In children with high RSA reactivity, chronic maternal depressive symptoms predicted the lowest levels of externalizing difficulties at 7 years  No association between children's automatic nervous system reactivity scores and maternal depressive symptoms  No associations between overcrowded housing and externalizing behaviors

ADBB: Alarm Distress Baby Scale; ARSM II: Acculturation Rating Scale for Mexican Americans; BASC-2: Behavior Assessment System for Children 2; BSI: Brief Symptom Inventory; BSID-II: Bayley Scales of Infant Development, Second Edition; CES-D: Center for Epidemiologic Studies-Depression Scale; CBCL: Child Behavior Checklist; CIDI: Composite International Diagnostic Interview; IBQ-R: Infant Behavior Questionnaire Revised; IES-R: Impact of Events Scale-Revised; FILE: Family Inventory of Life Events and Changes Scale; JTSEA-R: Infant Toddler Social Emotional Assessment; HHANES: Hispanic Health and Nutrition Examination Survey; MDI Bayley: Bayley II Mental Developmental Index; PARQ: Parental Acceptance/Rejection Questionnaire; PFW: Personal Financial Wellness Scale; PHQ-9: Patient Health Questionnaire-9; PSI-SF: The Parenting Stress Index-Short Form; SASH: Short Acculturation Scale for Hispanics; TAS-45: Toddler Attachment Sort-45 Instrument.

<https://doi.org/10.1371/journal.pone.0230256.t002>





**Fig 3. Timeline of studies reviewed (n = 15) based on maternal depression and child outcome assessments.**

<https://doi.org/10.1371/journal.pone.0230256.g003>

sensitivity in relation to child socioemotional outcomes; and 3) contextual stressors culturally relevant to Latina mothers and their young children living in poverty (economic and sociocultural stressors).

### Socioemotional outcomes

**Prenatal.** Studies (n = 2) conducted in the prenatal period found a significant relationship between prenatal depressive symptoms and infant self-regulation [56,57]. In Fuller et al.’s study, higher prenatal maternal depressive symptoms on a continuum (Patient Health Questionnaire-9, score range 5–27) positively moderated the relationship between neighborhood stress and infant self-regulatory difficulties (IBQ-R). Luecken et al.’s study measured the relationship between infant self-regulation (cortisol responses) and prenatal depressive symptoms (Edinburgh Postnatal Depression Scale  $\geq 13$ ). Both prenatal depressive symptoms and perceived lack of social support predicted disrupted infant self-regulatory processes as indicated

through dysfunctional cortisol responses: heightened cortisol output for 12-week old infants with high temperamental negativity but blunted cortisol for infants with low negativity [57]. Both studies co-varied for postpartum depressive symptoms, suggesting that dysfunctional self-regulatory processes were associated with the prenatal rather than postnatal psychosocial environment.

**Infancy.** Studies conducted during infancy ( $n = 2$ ) revealed significant correlations between maternal depression and adverse infant socioemotional outcomes. Six-month old infants whose mothers were diagnosed with major depression (based on the DSM-IV criteria) scored significantly higher than infants with non-depressed mothers on both intrapersonal and interpersonal social withdrawal behaviors (Alarm Distress Baby Scale): facial expression, vocalizations, relationship, attraction, eye contact, and self-stimulation [53]. Bidirectional interpersonal associations, implying disrupted social synchrony, were noted in a separate study: higher infant negativity (IBQ-R) at six weeks was associated with increased maternal depressive symptoms (EPDS  $> 13$ ) at 12 weeks; moreover, increased maternal depressive symptoms were associated with decreased social support [57]. Each study measuring infant outcomes ( $n = 4$ ) yielded a significant association between maternal depressive symptoms and adverse infant outcomes regardless of study design, analytical analysis, child outcome measures, or maternal depression measures.

**Toddlerhood.** Two studies focused on the relationship between maternal depressive symptoms and child outcomes in toddlers aged 12 to 36 months. Martinez examined the relationship between maternal depressive symptoms (CES-D  $\geq 16$ ) and child aggression, compliance, and negative emotionality (CBCL and Infant Toddler Social Emotional Assessment) [58]. Mild and moderate depressive symptoms at 24 months significantly predicted increased negative infant emotionality six months later [58]. Huang et al. examined the relationship between maternal depressive symptoms (CES-D  $\geq 16$  at nine months, Composite International Diagnostic Interview Short Form Instrument at 24 months), maternal sensitivity, and toddler child attachment (Toddler Attachment Sort-45 Instrument). Analyses stratified by ethnicity revealed that chronic maternal depression in Latina mothers posed a higher odds ratio for child insecure attachment at 24 months than any other ethnicity (Odds Ratio = 8.12, 95% Confidence Interval = 1.07–61.68,  $p = .04$ ) [2]; however, the significance of this association disappeared when maternal sensitivity was added into the model [2]. As such, both studies found significant relationships between toddler socioemotional outcomes and the chronicity [2] or severity [58] of maternal depressive symptoms.

**Preschool.** Four studies examined the correlation between maternal depressive symptoms and behavioral functioning (CBCL) in preschoolers. Neither La Roche et al. or Lequericia and Hermosa found significant associations between maternal depressive symptoms (CES-D  $\geq 16$  or subscale of Ilfield's Psychiatric Symptom Index) and preschool behavioral functioning [50,59]. However, neither study adjusted for potential confounding variables (e.g., maternal demographic characteristics, child's age), which could have obscured possible associations. Only when maternal depressive symptoms (CES-D  $\geq 16$ ) were combined with measures of stress did significant associations emerge between maternal depression and child behaviors: maternal depressive symptoms in conjunction with stress was significantly positively associated with child internalizing problems [60]. Two of these studies were cross-sectional [50,60], and one study spanned a three-month time-frame [59], providing a limited perspective into the trajectory of these associations.

During children's mental health treatment spanning three years, Mennen et al. found significant associations between maternal depressive symptoms (CES-D  $\geq 16$ ) and preschoolers' behavioral functioning: externalizing and internalizing behaviors (CBCL) and socialization (Vineland Screener) [61]. Compared to children whose mothers were not depressed, children

of mothers with depression began treatment with higher levels of internalizing and externalizing behaviors and lower socialization scores, progressed more slowly during treatment despite receiving more mental health services, and finished treatment with lower levels of behavioral functioning [61]. Unlike the consistently significant associations found between maternal depression and adverse infant outcomes, significant correlations during the preschool years emerged only when 1) the study design and analysis captured developmental changes over time or when 2) maternal depressive symptoms were combined with a measurement of stress.

**Infancy through early childhood.** In longitudinal studies spanning infancy through early childhood ( $n = 2$ ), the interaction between maternal depressive symptoms and an infant's regulatory capacity was found to predict child behavioral functioning through the preschool years [62] and middle childhood [63]. Infants' resting respiratory sinus arrhythmia (RSA) [62] and RSA reactivity [63] were measured as a physiological index for vagal tone and subsequent underlying regulatory capacity. The interaction between low infant RSA reactivity and exposure to maternal depressive symptoms ( $CES-D \geq 16$ ) at one and three-and-a-half years old predicted significantly greater externalizing difficulties (Behavior Assessment System for Children) at 7-years-old [63]. Likewise, the interaction between low infant resting RSA and exposure to depressive symptoms ( $EPDS \geq 13$ ) from three weeks to six months old predicted greater internalizing and externalizing child behavior problems (CBCL) at 36 months [62]. Additionally, higher maternal depressive symptoms ( $CES-D \geq 16$ ) at 36 months yielded other significant correlations: maternal depressive symptoms ( $EPDS \geq 13$ ) at six months and more child behavior problems [62]. In summary, the interaction between infant self-regulatory processes and the chronicity of maternal depressive symptoms predicted greater child behavioral difficulties [62,63]. Measurements assessing exposure to maternal depressive symptoms across multiple points in the child's life strengthened both studies.

### Maternal sensitivity

Two studies examined the relationship between maternal depressive symptoms, maternal sensitivity, and acculturation during toddlerhood and preschool [2,64]. In the ECLS-B's full sample representing the general population, maternal depressive symptoms measured at nine months ( $CES-D \geq 16$ ) and 24 months (Composite International Diagnostic Interview Short Form Instrument) were inversely associated with maternal sensitivity scores [2]. However, in analyses stratified by ethnicity, patterns of depression at nine months and 24 months (e.g., remittent, late onset, chronic) were not significantly associated with maternal sensitivity in Latina mothers [2]. In contrast, Palermo et al. found a significant inverse association between maternal sensitivity and maternal mental health problems—a variable combining maternal depressive symptoms ( $CES-D$ ), parenting stress, and self-efficacy measures. In both studies, more acculturated mothers scored significantly higher on maternal sensitivity measures than less acculturated mothers. In fact, maternal acculturation (as measured by either primary language use, nativity, or a combination of generational status and language proficiency), not maternal depressive symptoms, was most consistently and significantly associated with maternal sensitivity scores [2,64].

Maternal sensitivity was also tested as a mediator between maternal depressive symptoms and child outcomes. Combining stress and depression measures into one variable again yielded the stronger association: maternal sensitivity significantly mediated the association between maternal mental health problems and child behavioral functioning (Problem Behavior Scale) in preschoolers [64]. Although Huang et al. found that maternal sensitivity mediated the associations between maternal depressive symptoms and child attachment in toddlers, the mediation was not significant in Latina mother-child dyads—a finding that differed from the

ECLS-B's full sample [2]. In summary, unless maternal depressive symptoms were combined with maternal stress, maternal sensitivity scores were not correlated with maternal depression and did not function as a significant mediator between maternal depressive symptoms and child outcomes. Both studies assessed and adjusted for demographic moderators (e.g., socioeconomic status, maternal education).

### Economic and sociocultural stressors

**Economic stressors.** Studies using the FSM ( $n = 3$ ) during early childhood found consistent positive correlations between maternal depressive symptoms and economic stressors: food insecurity, community violence, and economic hardship [64–66]. Maternal depressive symptoms were then tested as a mediator between these poverty-related stressors and child outcomes. In a cross-sectional study examining Latino families in rural America across 13 states, maternal depressive symptoms (CES-D short form  $\geq 10$ ) were not found to significantly mediate the relationship between household food insecurity and child behavioral functioning (CBCL) [65]. The study was limited by its cross-sectional nature and the potentially confounding child age range (one-and-a-half to five years old, mean = 42 months). However, a longitudinal study examining children from a nationally representative sample of Head Start programs across one school year also found statistically non-significant effects: child behavioral functioning (Personal Maturity Scale, CBCL, Teacher Report, and the Behavior Problems Index) was not significantly associated with individual study variables: maternal depressive symptoms (CES-D short form  $\geq 10$ ), violence exposure, family structure, or parenting style [66]. Furthermore, maternal mental health problems (CES-D  $\geq 16$ , parenting stress, self-efficacy) and maternal sensitivity did not mediate the association between economic hardship and child behavioral functioning (Problem Behavior Scale) in a longer longitudinal study spanning 14 months until kindergarten entry [64].

Although the FSM studies provided no support for the mediating role of maternal depressive symptoms between poverty-related stressors and child outcomes, Aisenberg's cross-sectional study found that maternal distress symptomatology, as measured by depressive symptoms (BSI  $\geq 63$ ), anxiety, and adult post-traumatic stress disorder, significantly mediated the relationship between exposure to community violence and externalizing and internalizing behaviors (CBCL) in preschool children [67].

Two studies examined maternal depressive symptoms as a moderator between economic stressors and child outcomes. Waters et al. tested both chronic overcrowded housing and chronic maternal depressive symptoms (CES-D  $\geq 16$ ) as potential moderators between child RSA reactivity and child externalizing behavioral difficulties (BASC-2) from infancy through middle childhood [63]. Only maternal depressive symptoms functioned as a significant moderator, indicating that maternal depression posed a stronger risk for children than overcrowded housing in a sample of Mexican-American dyads [63]. Fuller et al. tested maternal depressive symptoms on a continuum (PHQ-9, score range 5–27) as a moderator between infant temperament (IBQ-R) and prenatal material hardship (food insecurity, housing disrepair, financial difficulty, neighborhood stress) [56]. Prenatal depressive symptoms significantly moderated the relationship between neighborhood stress and low infant regulatory capacity [56].

**Acculturation.** Two studies examined the relationship between maternal depressive symptoms and child socioemotional outcomes in context of acculturation (i.e., cultural adaptation) [2,64]. A culturally integrated FSM tested whether acculturation levels moderated the pattern of associations between maternal mental health problems (CES-D, parenting stress, self-efficacy) and preschool behavioral functioning (Problem Behavior Scale) [64]. Palermo

et al. found significantly higher measures of maternal sensitivity in more acculturated mothers compared to less acculturated mothers, but adding maternal acculturation measures to models did not moderate the associations between maternal mental health problems and child outcomes. Nor did maternal nativity status moderate the associations among maternal depressive symptoms ( $\text{CES-D} \geq 16$ ), maternal sensitivity, and child attachment [2].

Despite the lack of studies explicitly examining the effects of maternal acculturation on the relationship between maternal depression and child development, a significant pattern repeatedly emerged across studies. Children of U.S.-born Latina mothers had consistently poorer socioemotional outcomes than children of foreign-born Latina mothers across domains and developmental windows: higher infant negativity in two studies [56,57]; higher rates of insecure attachment in toddlers, including almost double the rate (20.7% vs 11.5%) of disorganized attachment, the most maladaptive style [2]; and higher externalizing and internalizing behavioral problems in preschoolers [62]. Higher rates of insecure attachment in toddlers (49.4% vs 39.6%) occurred *despite* higher maternal sensitivity scores, family incomes, and maternal education levels in U.S.-born Latina mothers from the ECLS-B [2]. Furthermore, higher child internalizing and externalizing behavior problems in preschoolers occurred *despite* higher resting RSA levels, a measure found to protect children significantly from socioemotional difficulties in the full sample of Mexican-American children [62]. Potential links between maternal nativity status *and* maternal depression in relation to child outcomes remained predominantly unexplored, leaving a gap in our understanding.

## Discussion

This systematic review examined the relationship between maternal depression in Latina mothers and their children's socioemotional outcomes from birth to five years of age. Fifteen studies with a total of  $n = 5,656$  mother-child participants met our inclusion criteria. Of the eleven studies published within the past ten years, seven were published in the past five years, indicating that the relationship between maternal depression in Latinas and child development has only recently begun to receive scholarly attention.

Consistent with previous meta-analyses conducted on European-White mother-child dyads, the preschool years were the least likely to yield statistically significant inverse associations between maternal depression and child well-being; infancy had the strongest inverse correlations, suggesting that younger children may be more vulnerable to the influences of maternal depression [1,8]. Chronicity and severity of maternal depression also predicted child outcomes; more frequent exposure to maternal depression across infancy and early childhood was linked to increased child maladjustment by early and middle childhood. We also found some evidence for the moderating [56,63] and mediating role [67] of maternal depression between contextual stressors and child outcomes. Maternal stress in conjunction with depression heightened associations between maternal depression and child maladjustment [60,64,67]. In contrast, maternal sensitivity less consistently affected the relationship between maternal depression and child outcomes [2,64]. One of the most consistent patterns emerged between maternal nativity and child socioemotional development: children of U.S.-born Latina mothers had significantly poorer developmental outcomes than children of foreign-born Latina mothers across socioemotional domains and throughout early developmental windows—from infant negativity to toddler attachment and preschool behavioral functioning [2,56,57,62].

## Maternal sensitivity

Maternal sensitivity scores were more consistently correlated with maternal acculturation than maternal depression, whereby high levels of maternal acculturation were linked to high levels

of maternal sensitivity scores—thus raising the question “Are maternal sensitivity measures more closely linked to cultural assimilation than maternal processes that protect children?” Although previous research has supported maternal sensitivity as a protective cross-cultural construct critical for healthy child developmental outcomes [68], some evidence asserts that measures used to operationalize this complex construct may be culture-specific [69]. In fact, the Nursing Child Assessment Teaching Scale, used to measure maternal sensitivity during infancy in the ECLS-B, may detect maternal knowledge of early child development more sensitively than either maternal depression or self-efficacy [70]. Although positive correlations between maternal sensitivity and preschooler’s behavioral functioning suggest that maternal sensitivity measures may at least partially apply to Latina mothers in relation to child well-being [64], measures are likely not capturing key maternal processes specific to less acculturated Latina mothers; these processes warrant further exploration. Moreover, considering that increased maternal sensitivity scores in more acculturated Latina mothers did not moderate the relationship between maternal depression and child outcomes in toddlers or preschoolers [2,64], unexplored interpersonal or contextual factors in relation to maternal depression may play a superseding role in determining child well-being.

### **Economic and sociocultural stressors**

Depression has long been recognized as an interdependent phenomenon inextricably linked to interpersonal and contextual factors [71]. As such, economic stressors and lack of social support were significantly associated with maternal depression in our studies. We also found some evidence for the mediating [67] and moderating [56,63] role of maternal depression between poverty-related stressors and child socioemotional outcomes. Our review found no support for using the FSM during the preschool years, in contrast to FSM studies conducted during middle childhood and adolescence within the broader literature [31,32,72]. Perhaps the cumulative effects of chronic stressors are not measurable until later in childhood. The preschool years, however, were the least likely to yield significant associations between maternal depression and child development in our studies unless maternal depression was combined with a measure of stress. Elevated scores on both maternal depression and stress measures may reflect more chronic depressive symptoms [73], a pattern of depression associated with greater risk for child maladjustment in our longitudinal studies [2,62,63]. Moreover, some empirical evidence suggests that maternal stress (e.g., parenting stress, limited social support, marital conflict) may mediate the relationship between maternal depression and behavior problems in toddlers [74] and preschoolers [73]. In immigrant Latino families, economic stressors combined with parental immigration-related stress have predicted increased behavioral difficulties in preschoolers [75].

Although studies in our review did not address specific sociocultural stressors, a small but growing body of literature shows that culturally relevant precursors of maternal depression in Latina mothers (e.g., stressful life events, discrimination, acculturative stress) have been associated with socioemotional maladjustment during early developmental windows, suggesting that maternal stress in general may affect a child’s capacity for healthy socioemotional outcomes beginning as early as the prenatal period [38,76–78]. Moreover, bio-behavioral profiles indicative of chronic stress across succeeding generations have been found in Mexican-origin women, whereby third generation women exhibited blunted maternal cortisol during pregnancy [79].

These increasing socioemotional vulnerabilities echo our findings linking consistently poorer socioemotional outcomes to children of U.S.-born mothers compared to children of foreign-born mothers. Such outcomes occurred even within the context of higher family



incomes, maternal education, and higher levels of maternal sensitivity scores frequently found in succeeding generations [2]. A previous study examining school readiness also noted healthier socioemotional adjustment in kindergarten children of foreign-born Latino parents compared to children of U.S.-born parents of other races and ethnicities, as rated by teachers [80]. Similarly, a study examining the relationship between cultural adaptation in parents and behavioral functioning in preschoolers found that high US identity in Latino parents was associated with more externalizing behaviors, whereas higher ethnic parental identity predicted lower levels of child externalizing and internalizing behaviors [81]. Increased parental acculturation, as measured by language usage, has also been linked to lower (i.e., less adaptive) cortisol responses in preschoolers living in poverty [75]. Although cross-generational research supports an immigrant paradox in behavioral outcomes during adolescence (e.g., substance abuse, teen pregnancy, delinquency), research examining socioemotional outcomes in children under five years of age has been scarce [82]. This is the first review, to our knowledge, to have found support for the Latino paradox in early childhood mental health. If an immigrant advantage exists throughout early developmental windows in the socioemotional domain, why and when does it erode?

The interaction between maternal nativity and maternal mental health in relation to child outcomes was rarely examined in our studies, preventing us from fully grasping the underlying mechanisms for this apparent decline. However, our findings clearly indicate that a) this pattern can be observed within sensitive early developmental windows; b) maternal mental health and early child development are intimately connected; and c) contextual stressors are salient precursors of maternal mental health. Maternal biopsychosocial stress across generations stemming from the chronic stressors inherent in inequitable societal structures may be a salient contributing factor; protective cultural factors such as collectivism that confer psychological resilience [83] may also be lost in subsequent generations. Combining models based on risk (e.g., developmental-risk framework) and resilience (e.g., ecocultural theory) may help elucidate underlying mechanisms for the Latino Paradox [84].

### Clinical implications

Maternal depression is treatable, and its effects on child socioemotional outcomes can be minimized. A meta-analysis revealed that non-pharmaceutical treatment of depression during pregnancy not only improved maternal mood but improved child functioning—particularly infant regulatory capacity [85]. These outcomes provide causal support for the link between prenatal depression and infant socioemotional outcomes as well as subsequent evidence for the intergenerational transmission of mental health disparities. Furthermore, the World Health Organization recommends that interventions should treat maternal depression *and* support the mother-child relationship concurrently [24]. Well-designed, culturally responsive interventions that mitigate maternal stress and strengthen the mother-child relationship may also foster healthy child development. Although depression is treatable and support is critical during early developmental windows when interventions would be most preventative and cost-effective, treatment often remains inaccessible to Latina mothers even after controlling for income levels [6,86]. Given that maternal depression is highly correlated with adversity, lack of appropriate treatment for mothers suffering from depression and their young children may further compound disparities in children's socioemotional development. Policies should address the need to support maternal mental health as early as the prenatal period.

Effective interventions for maternal depression in Latinas have focused on culturally sensitive psychoeducation, emotional support, and access to community resources [87].

Exploratory family-level interventions have also embraced potential sociocultural strengths such as kinship and familism (i.e., family interdependence), resulting in decreased maternal depressive symptoms and decreased internalizing and externalizing behaviors in children [88]. Moreover, a culturally-tailored intervention targeting postpartum depression and mother-child interactions in infants and toddlers lowered maternal depression scores and improved maternal perceptions of the child's socioemotional competence [89]. Upstream approaches in immigrant women should address culturally relevant stressors and barriers that contribute to depression and stress, such as potential and poignant losses experienced during immigration: social support networks lost through family separation, a sense of belonging dislodged by discrimination, and access to community resources impeded by language barriers [41].

### Limitations

Due to scarce research examining maternal depression in Latinas and child socioemotional outcomes, we had a limited number of studies—five of which were cross-sectional. Studies were too heterogeneous to conduct a meta-analysis. Furthermore, most studies during the preschool years used maternal-reported measures of child behavior such as the CBCL. Behavior ratings may be influenced by maternal cultural expectations [20] and maternal depression. Mothers with depression may be more likely to view their children negatively, resulting in potentially biased ratings [1]. However, three out of five studies using maternal reported child measures in longitudinal studies adjusted for concurrent depression.

We also only included studies conducted in the US. Although this focus prevented confounding factors that may have arisen from research in several host countries, our findings cannot be generalized outside of the US. Moreover, the Latino population is not homogeneous; subpopulations from Latin American countries have various socioeconomic and cultural backgrounds as well as reasons for coming to the United States [90]. Furthermore, acculturation may differ among Latino sub-groups [38]. Although we extracted data such as country of origin and acculturation, eight studies did not include country of origin, and seven did not measure acculturation.

### Conclusions

This is the first systematic review to examine Latina mother-child dyads in relation to maternal depression and child socioemotional development. We found significant positive correlations between maternal depression and contextual stressors, inverse correlations between maternal depression and child well-being, and evidence of the moderating and mediating role of maternal depression between contextual stressors and child socioemotional outcomes. We also connected fragmented evidence across studies delineating a concerning and significant cross-generational decline in young Latino children's socioemotional outcomes; future research should examine the underlying mechanisms. Indeed, socioemotional developmental processes are critical throughout infancy and early childhood—processes allowing children to form friendships, learn in school, develop resiliency, and eventually strengthen our intrinsically interconnected society [91].

### Supporting information

**S1 Table. Prisma 2009 checklist.**  
(PDF)

**S2 Table. Cognitive outcomes.**  
(DOCX)

**S1 File. Protocol for systematic review.**  
(PDF)

## Acknowledgments

We would like to thank Dr. Beth Black for editorial suggestions.

## Author Contributions

**Conceptualization:** Rebeca Alvarado Harris, Hudson P. Santos, Jr.

**Data curation:** Rebeca Alvarado Harris, Hudson P. Santos, Jr.

**Formal analysis:** Rebeca Alvarado Harris.

**Investigation:** Rebeca Alvarado Harris, Hudson P. Santos, Jr.

**Methodology:** Hudson P. Santos, Jr.

**Resources:** Hudson P. Santos, Jr.

**Supervision:** Hudson P. Santos, Jr.

**Writing – original draft:** Rebeca Alvarado Harris.

**Writing – review & editing:** Rebeca Alvarado Harris, Hudson P. Santos, Jr.

## References

1. Goodman SH, Rouse MH, Connell AM, Broth MR, Hall CM, et al. (2011) Maternal depression and child psychopathology: a meta-analytic review. *Clin Child Fam Psychol Rev* 14: 1–27. <https://doi.org/10.1007/s10567-010-0080-1> PMID: 21052833
2. Huang ZJ, Lewin A, Mitchell SJ, Zhang J (2012) Variations in the relationship between maternal depression, maternal sensitivity, and child attachment by race/ethnicity and nativity: findings from a nationally representative cohort study. *Matern Child Health J* 16: 40–50. <https://doi.org/10.1007/s10995-010-0716-2> PMID: 21107669
3. U.S. Census Bureau (2017) 2017 American community survey 1-year estimates. . Available: <https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk>. Accessed 24 August 2019.
4. Lara-Cinisomo S, Wisner KL. Perinatal depression among Spanish-speaking and Latin American women. New York, NY: Springer New York; 2014. <https://doi.org/10.1007/978-1-4614-8045-7>
5. Blackmore ER, Chaudron L (2014) Psychosocial and cultural considerations in detecting and treating depression in Latina perinatal women in the United States. In: Lara-Cinisomo S, Wisner KL, editors. *Perinatal Depression among Spanish-Speaking and Latin American Women*. New York, NY: Springer New York. pp. 83–96. [https://doi.org/10.1007/978-1-4614-8045-7\\_6](https://doi.org/10.1007/978-1-4614-8045-7_6)
6. Lara-Cinisomo S, Clark CT, Wood J (2018) Increasing diagnosis and treatment of perinatal depression in Latinas and African American women: addressing stigma is not enough. *Womens Health Issues* 28: 201–204. <https://doi.org/10.1016/j.whi.2018.01.003> PMID: 29471984
7. Yates T, Ostrosky M, Cheatham G, Fettig A, Shaffer L, et al. (2008) Research synthesis on screening and assessing social-emotional competence. Available: [http://csefel.vanderbilt.edu/documents/rs\\_screening\\_assessment.pdf](http://csefel.vanderbilt.edu/documents/rs_screening_assessment.pdf) Accessed 06 December 2019.
8. Beck CT (1998) The effects of postpartum depression on child development: a meta-analysis. *Arch Psychiatr Nurs* 12: 12–20. [https://doi.org/10.1016/s0883-9417\(98\)80004-6](https://doi.org/10.1016/s0883-9417(98)80004-6) PMID: 9489170
9. Campbell SB, Denham SA, Howarth GZ, Jones SM, Whittaker JV, et al. (2016) Commentary on the review of measures of early childhood social and emotional development: Conceptualization, critique, and recommendations. *J Appl Dev Psychol* 45: 19–41. <https://doi.org/10.1016/j.appdev.2016.01.008>
10. Sroufe LA (2005) Attachment and development: a prospective, longitudinal study from birth to adulthood. *Attach Hum Dev* 7: 349–367. <https://doi.org/10.1080/14616730500365928> PMID: 16332580
11. Ertel KA, Rich-Edwards JW, Koenen KC (2011) Maternal depression in the United States: nationally representative rates and risks. *J Womens Health (Larchmt)* 20: 1609–1617. <https://doi.org/10.1089/jwh.2010.2657> PMID: 21877915

12. Entringer S, Buss C, Wadhwa PD (2015) Prenatal stress, development, health and disease risk: A psychobiological perspective-2015 Curt Richter Award Paper. *Psychoneuroendocrinology* 62: 366–375. <https://doi.org/10.1016/j.psyneuen.2015.08.019> PMID: 26372770
13. Van den Bergh BRH, van den Heuvel MI, Lahti M, Braeken M, de Rooij SR, et al. (2017) Prenatal developmental origins of behavior and mental health: The influence of maternal stress in pregnancy. *Neurosci Biobehav Rev*. <https://doi.org/10.1016/j.neubiorev.2017.07.003> PMID: 28757456
14. Johnson M, Deardorff J, Davis EL, Martinez W, Eskenazi B, et al. (2017) The relationship between maternal responsiveness, socioeconomic status, and resting autonomic nervous system functioning in Mexican American children. *Int J Psychophysiol* 116: 45–52. <https://doi.org/10.1016/j.ijpsycho.2017.02.010> PMID: 28238817
15. Chiao JY, Li S-C, Seligman R, Turner R. *The oxford handbook of cultural neuroscience*. Oxford University Press; 2015. <https://doi.org/10.1093/oxfordhb/9780199357376.001.0001>
16. Goodman SH, Garber J (2017) Evidence-based interventions for depressed mothers and their young children. *Child Dev* 88: 368–377. <https://doi.org/10.1111/cdev.12732> PMID: 28160275
17. Bernard K, Nissim G, Vaccaro S, Harris JL, Lindhiem O (2018) Association between maternal depression and maternal sensitivity from birth to 12 months: a meta-analysis. *Attach Hum Dev* 20: 578–599. <https://doi.org/10.1080/14616734.2018.1430839> PMID: 29374991
18. Lovejoy MC, Graczyk PA, O'Hare E, Neuman G (2000) Maternal depression and parenting behavior: a meta-analytic review. *Clin Psychol Rev* 20: 561–592. [https://doi.org/10.1016/s0272-7358\(98\)00100-7](https://doi.org/10.1016/s0272-7358(98)00100-7) PMID: 10860167
19. Mesman J, van IJzendoorn MH, Bakermans-Kranenburg MJ (2012) Unequal in opportunity, equal in process: parental sensitivity promotes positive child development in ethnic minority families. *Child Dev Perspect* 6: 239–250. <https://doi.org/10.1111/j.1750-8606.2011.00223.x>
20. Chen X, Rubin KH (2011) *Socioemotional development in cultural context*. New York: Guilford Press, 2011.
21. Gosh Ippen C (2009) The sociocultural context of infant mental health: Towards contextually congruent interventions. In: Zeanah CH, editor. *Handbook of Infant Mental Health*. New York: Guilford Press; 2009. p. 104–119.
22. Iruka IU, Laforett DR, Odom EC (2012) Examining the validity of the family investment and stress models and relationship to children's school readiness across five cultural groups. *J Fam Psychol* 26: 359–370. <https://doi.org/10.1037/a0028290> PMID: 22545934
23. Ispa JM, Fine MA, Halgunseth LC, Harper S, Robinson J, et al. (2004) Maternal intrusiveness, maternal warmth, and mother-toddler relationship outcomes: variations across low-income ethnic and acculturation groups. *Child Dev* 75: 1613–1631. <https://doi.org/10.1111/j.1467-8624.2004.00806.x> PMID: 15566369
24. Parsons CE, Young KS, Rochat TJ, Kringelbach ML, Stein A (2012) Postnatal depression and its effects on child development: a review of evidence from low- and middle-income countries. *Br Med Bull* 101: 57–79. <https://doi.org/10.1093/bmb/ldr047> PMID: 22130907
25. Zeanah CH (2019) *Handbook of infant mental health*. Available: <https://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&db=nlabk&AN=1843598>.
26. U.S.Census Bureau (2017) People in families by family structure, age, and sex, iterated by income-to-poverty ratio and race. Available: <https://www.census.gov/data/tables/time-series/demo/income-poverty/cps-pov/pov-02.html>. Accessed 24 August 2019.
27. Madigan S, Oatley H, Racine N, Fearon RMP, Schumacher L, et al. (2018) A meta-analysis of maternal prenatal depression and anxiety on child socioemotional development. *J Am Acad Child Adolesc Psychiatry* 57: 645–657. e8. <https://doi.org/10.1016/j.jaac.2018.06.012> PMID: 30196868
28. Masarik AS, Conger RD (2017) Stress and child development: a review of the family stress model. *Curr Opin Psychol* 13: 85–90. <https://doi.org/10.1016/j.copsyc.2016.05.008> PMID: 28813301
29. Mistry RS, Vandewater EA, Huston AC, McLoyd VC (2002) Economic well-being and children's social adjustment: the role of family process in an ethnically diverse low-income sample. *Child Dev* 73: 935–951. <https://doi.org/10.1111/1467-8624.00448> PMID: 12038561
30. Borthwick-Duffy J (2003) Economic pressure, maternal depression, and child adjustment in Latino families: An exploratory study. *Journal of Family and Economic Issues* 24: 183–202.
31. Parke RD, Coltrane S, Duffy S, Buriel R, Dennis J, et al. (2004) Economic stress, parenting, and child adjustment in Mexican American and European American families. *Child Dev* 75: 1632–1656. <https://doi.org/10.1111/j.1467-8624.2004.00807.x> PMID: 15566370
32. Pachter LM, Auinger P, Palmer R, Weitzman M (2006) Do parenting and the home environment, maternal depression, neighborhood, and chronic poverty affect child behavioral problems differently in

- different racial-ethnic groups? *Pediatrics* 117: 1329–1338. <https://doi.org/10.1542/peds.2005-1784> PMID: 16585331
33. Hurwich-Reiss E, Watamura SE (2019) Family processes among Latino Early Head Start families: Understanding the role of caregiver acculturation. *J Community Psychol* 47: 1433–1448. <https://doi.org/10.1002/jcop.22198> PMID: 31066922
  34. Coll CG, Akerman A, Cicchetti D (2000) Cultural influences on developmental processes and outcomes: Implications for the study of development and psychopathology. *Dev Psychopathol* 12: 333–356 <https://doi.org/10.1017/S0954579400003059> PMID: 11014742
  35. Causadias JM, Cicchetti D (2018) Cultural development and psychopathology. *Dev Psychopathol* 30: 1549–1555. <https://doi.org/10.1017/S0954579418001220> PMID: 30451138
  36. Berry JW (2006) Acculturative Stress. In: Wong PTP, Wong LCJ, editors. *Handbook of multicultural perspectives on stress and coping*. Boston, MA: Springer US. pp. 287–298. [https://doi.org/10.1007/0-387-26238-5\\_12](https://doi.org/10.1007/0-387-26238-5_12)
  37. Zeiders KH, Umaña-Taylor AJ, Jahromi LB, Updegraff KA, White RMB (2016) Discrimination and acculturations stress: A longitudinal study of children's well-being from prenatal development to 5 years of age. *J Dev Behav Pediatr* 37: 557–564. <https://doi.org/10.1097/DBP.0000000000000321> PMID: 27571330
  38. Rubin LP (2016) Maternal and pediatric health and disease: integrating biopsychosocial models and epigenetics. *Pediatr Res* 79: 127–135. <https://doi.org/10.1038/pr.2015.203> PMID: 26484619
  39. Romero A, Piña-Watson B (2017) *Acculturative stress and bicultural stress*. Schwartz SJ, Unger J, editors Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780190215217.013.8>
  40. Ornelas IJ, Perreira KM (2011) The role of migration in the development of depressive symptoms among Latino immigrant parents in the USA. *Soc Sci Med* 73: 1169–1177. <https://doi.org/10.1016/j.socscimed.2011.07.002> PMID: 21908089
  41. D'Anna-Hernandez KL, Aleman B, Flores A-M (2015) Acculturative stress negatively impacts maternal depressive symptoms in Mexican-American women during pregnancy. *J Affect Disord* 176: 35–42. <https://doi.org/10.1016/j.jad.2015.01.036> PMID: 25699668
  42. Fox M, Thayer ZM, Ramos IF, Meskal SJ, Wadhwa PD (2018) Prenatal and postnatal mother-to-child transmission of acculturation's health effects in Hispanic Americans. *J Womens Health (Larchmt)* 27: 1054–1063. <https://doi.org/10.1089/jwh.2017.6526> PMID: 29608128
  43. Santos HP, Nephew BC, Bhattacharya A, Tan X, Smith L, et al. (2018) Discrimination exposure and DNA methylation of stress-related genes in Latina mothers. *Psychoneuroendocrinology* 98: 131–138. <https://doi.org/10.1016/j.psyneuen.2018.08.014> PMID: 30144780
  44. Flores MES, Simonsen SE, Manuck TA, Dyer JM, Turok DK (2012) The "Latina epidemiologic paradox": Contrasting patterns of adverse birth outcomes in U.S.-born and foreign-born Latinas. *Womens Health Issues* 22: e501–7. <https://doi.org/10.1016/j.whi.2012.07.005> PMID: 22944904
  45. Gill SL (2009) Breastfeeding by Hispanic women. *J Obstet Gynecol Neonatal Nurs* 38: 244–252. <https://doi.org/10.1111/j.1552-6909.2009.01013.x> PMID: 19323721
  46. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009 Jul 21; 6(7):e1000097. <https://doi.org/10.1371/journal.pmed.1000097> PMID: 19621072
  47. Santos H, Fried EI, Asafu-Adjei J, Ruiz RJ (2017) Network structure of perinatal depressive symptoms in Latinas: relationship to stress and reproductive biomarkers. *Res Nurs Health* 40: 218–228. <https://doi.org/10.1002/nur.21784> PMID: 28220506
  48. Holditch-Davis D, Santos H, Levy J, White-Traut R, O'Shea TM, et al. (2015) Patterns of psychological distress in mothers of preterm infants. *Infant Behav Dev* 41: 154–163. <https://doi.org/10.1016/j.infbeh.2015.10.004> PMID: 26495909
  49. Study Quality Assessment Tools | National Heart, Lung, and Blood Institute (NHLBI) [Internet]. [cited 2019 Jan 3]. Available from: <https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools>
  50. Lequerica M, Hermosa B (1995) Maternal reports of behavior problems in preschool Hispanic children: An exploratory study in preventive pediatrics. *J Natl Med Assoc* 87: 861–868. PMID: 8558617
  51. Achenbach TM (1992) *Manual for the child behavior checklist/2-3 and 1992 profile*. Burlington, VT: Department of Psychiatry, University of Vermont, c1992.
  52. Putnam SP, Helbig AL, Gartstein MA, Rothbart MK, Leerkes E (2014) Development and assessment of short and very short forms of the infant behavior questionnaire-revised. *J Pers Assess* 96: 445–458. <https://doi.org/10.1080/00223891.2013.841171> PMID: 24206185
  53. Burtchen N, Alvarez-Segura M, Mendelsohn AL, Dreyer BP, Castellanos FX, et al. (2013) Screening for sustained social withdrawal behaviors in six-month-old infants during pediatric primary care visits:



- results from an at-risk latino immigrant sample with high rates of maternal major depressive disorder. *Infant Ment Health J* 34: 542–552. <https://doi.org/10.1002/imhj.21418>
54. Richards Martin P. M. (1974) *The integration of a child into a social world*. London; New York: Cambridge University Press.
  55. Fuligni AS, Brooks-Gunn J (2013) Mother–child Interactions in Early Head Start: Age and ethnic differences in low-income dyads. *Parenting* 13: 1–26. <https://doi.org/10.1080/15295192.2013.732422>
  56. Fuller A, Messito MJ, Mendelsohn AL, Oyeku SO, Gross RS (2018) Prenatal material hardships and infant regulatory capacity at 10 months old in low-income Hispanic Mother-Infant Pairs. *Acad Pediatr* 18: 897–904. <https://doi.org/10.1016/j.acap.2018.04.134> PMID: 29729425
  57. Luecken LJ, MacKinnon DP, Jewell SL, Crnic KA, Gonzales NA (2015) Effects of prenatal factors and temperament on infant cortisol regulation in low-income Mexican American families. *Dev Psychobiol* 57: 961–973. <https://doi.org/10.1002/dev.21328> PMID: 26119970
  58. Martinez MI. Young Latino children at risk for psychopathology: Effects of maternal depressive symptoms on child behavior. Dissertation, The University of North Carolina at Chapel Hill. 2015. Available from: <https://cdr.lib.unc.edu/indexablecontent/uuid:7c507236-28a1-4adf-8498-762982fd4d51>.
  59. Roche La, Castellano Kalick LR MJ, Turner C, Kalick S (1995) Latina mothers and their toddlers' behavioral difficulties. *Hispanic Journal of Behavioral Sciences* 17: 375–384.
  60. Siantz ML de L, Coronado N, Dovydaitis T (2010) Maternal predictors of behavioral problems among Mexican migrant farmworker children. *J Fam Nurs* 16: 322–343. <https://doi.org/10.1177/1074840710376946> PMID: 20686105
  61. Mennen FE, Pohle C, Monro WL, Duan L, Finello KM, et al. (2015) The effect of maternal depression on young children's progress in treatment. *J Child Fam Stud* 24: 2088–2098. <https://doi.org/10.1007/s10826-014-0010-9>
  62. Somers JA, Luecken LJ, Spinrad TL, Crnic KA (2018) Biological sensitivity to the effects of maternal postpartum depressive symptoms on children's behavior problems. *Child Dev*. <https://doi.org/10.1111/cdev.13114> PMID: 29992544
  63. Waters SF, Boyce WT, Eskenazi B, Alkon A (2016) The impact of maternal depression and over-crowded housing on associations between autonomic nervous system reactivity and externalizing behavior problems in vulnerable Latino children. *Psychophysiology* 53: 97–104. <https://doi.org/10.1111/psyp.12539> PMID: 26681621
  64. Palermo F, Ispa JM, Carlo G, Streit C (2018) Economic hardship during infancy and U.S. Latino preschoolers' sociobehavioral health and academic readiness. *Dev Psychol* 54: 890–902. <https://doi.org/10.1037/dev0000476> PMID: 29251967
  65. Doudna K. Application of the family stress model in populations of rural Latina mothers. Dissertation, Iowa State University. 2016. Available from: <https://lib.dr.iastate.edu/etd/15118>
  66. Westbrook TR, Harden BJ (2010) Pathways among exposure to violence, maternal depression, family structure, and child outcomes through parenting: a multigroup analysis. *Am J Orthopsychiatry* 80: 386–400. <https://doi.org/10.1111/j.1939-0025.2010.01042.x> PMID: 20636944
  67. Aisenberg E (2001) The Effects of Exposure to Community Violence upon Latina Mothers and Pre-school Children. *Hisp J Behav Sci* 23: 378–398. <https://doi.org/10.1177/0739986301234003>
  68. Posada G, Trumbell J, Noblega M, Plata S, Peña P, et al. (2016) Maternal sensitivity and child secure base use in early childhood: studies in different cultural contexts. *Child Dev* 87: 297–311. <https://doi.org/10.1111/cdev.12454> PMID: 26525825
  69. Dawson N, Bain K, Mesman J (2018) Comparing two measures of maternal sensitivity: goodness of fit with a South African cultural context. *Attach Hum Dev*: 1–9. <https://doi.org/10.1080/14616734.2018.1454056> PMID: 29587580
  70. Gross D, Conrad B, Fogg L, Willis L, Garvey C (1993) What does the NCATS measure? *Nur.s Res* 42: 260–265. <https://doi.org/10.1097/00006199-199309000-00002>
  71. Coyne JC, Downey G (1991) Social factors and psychopathology: stress, social support, and coping processes. *Annu Rev Psychol* 42: 401–425. <https://doi.org/10.1146/annurev.ps.42.020191.002153> PMID: 2018399
  72. Lorenzo-Blanco EI, Meca A, Unger JB, Romero A, Szapocznik J, et al. (2017) Longitudinal effects of Latino parent cultural stress, depressive symptoms, and family functioning on youth emotional well-being and health risk behaviors. *Fam Process* 56: 981–996. <https://doi.org/10.1111/famp.12258> PMID: 27774629
  73. Dawson G, Ashman SB, Panagiotides H, Hessl D, Self J, et al. (2003) Preschool outcomes of children of depressed mothers: role of maternal behavior, contextual risk, and children's brain activity. *Child Dev* 74: 1158–1175. <https://doi.org/10.1111/1467-8624.00599> PMID: 12938711



74. Cicchetti D, Rogosch FA, Toth SL (1998) Maternal depressive disorder and contextual risk: Contributions to the development of attachment insecurity and behavior problems in toddlerhood. *Dev Psychopathol* 10: 283–300. <https://doi.org/10.1017/s0954579498001618> PMID: 9635225
75. Mendoza MM, Dmitrieva J, Perreira KM, Hurwich-Reiss E, Watamura SE (2017) The effects of economic and sociocultural stressors on the well-being of children of Latino immigrants living in poverty. *Cultur Divers Ethnic Minor Psychol* 23: 15–26. <https://doi.org/10.1037/cdp0000111> PMID: 28045307
76. Lin B, Crnic KA, Luecken LJ, Gonzales NA (2014) Maternal prenatal stress and infant regulatory capacity in Mexican Americans. *Infant Behav Dev* 37: 571–582. <https://doi.org/10.1016/j.infbeh.2014.07.001> PMID: 25113917
77. Lin B, Crnic KA, Luecken LJ, Gonzales NA (2017) Ontogeny of emotional and behavioral problems in a low-income, Mexican American sample. *Dev Psychol* 53: 2245–2260. <https://doi.org/10.1037/dev0000391> PMID: 28933887
78. Rosenthal L, Earnshaw VA, Moore JM, Ferguson DN, Lewis TT, et al. (2018) Intergenerational consequences: Women's experiences of discrimination in pregnancy predict infant social-emotional development at 6 months and 1 Year. *J Dev Behav Pediatr* 39: 228–237. <https://doi.org/10.1097/DBP.0000000000000529> PMID: 29176360
79. Ruiz RJ, Stowe RP, Brown A, Wommack J (2012) Acculturation and biobehavioral profiles in pregnant women of Hispanic origin: generational differences. *ANS Adv Nurs Sci* 35: E1–E10. <https://doi.org/10.1097/ANS.0b013e3182626199> PMID: 22869214
80. Crosnoe R, Turley RNL (2011) K-12 educational outcomes of immigrant youth. *Future Child* 21: 129–152. <https://doi.org/10.1353/foc.2011.0008> PMID: 21465858
81. Calzada EJ, Brotman LM, Huang K-Y, Bat-Chava Y, Kingston S (2009) Parent cultural adaptation and child functioning in culturally diverse, urban families of preschoolers. *J Appl Dev Psychol* 30: 515–524. <https://doi.org/10.1016/j.appdev.2008.12.033> PMID: 20559417
82. García Coll C, Marks AK, editors (2012) *The immigrant paradox in children and adolescents: Is becoming American a developmental risk?* Washington: American Psychological Association. <https://doi.org/10.1037/13094-000>
83. Chiao JY, Blizinsky KD (2010) Culture-gene coevolution of individualism-collectivism and the serotonin transporter gene. *Proc Biol Sci* 277: 529–537. <https://doi.org/10.1098/rspb.2009.1650> PMID: 19864286
84. Marks AK, Ejesi K, García Coll C (2014) Understanding the U.S. immigrant paradox in childhood and adolescence. *Child Dev Perspect* 8: 59–64. <https://doi.org/10.1111/cdep.12071>
85. Goodman SH, Cullum KA, Dimidjian S, River LM, Kim CY (2018) Opening windows of opportunities: Evidence for interventions to prevent or treat depression in pregnant women being associated with changes in offspring's developmental trajectories of psychopathology risk. *Dev Psychopathol* 30: 1179–1196. <https://doi.org/10.1017/S0954579418000536> PMID: 30068424
86. Kozhimannil KB, Trinacty CM, Busch AB, Huskamp HA, Adams AS (2011) Racial and ethnic disparities in postpartum depression care among low-income women. *Psychiatr Serv* 62: 619–625. [https://doi.org/10.1176/ps.62.6.pss6206\\_0619](https://doi.org/10.1176/ps.62.6.pss6206_0619) PMID: 21632730
87. Baker-Ericzén MJ, Connelly CD, Hazen AL, Dueñas C, Landsverk JA, et al. (2012) A collaborative care telemedicine intervention to overcome treatment barriers for Latina women with depression during the perinatal period. *Fam Syst Health* 30: 224–240. <https://doi.org/10.1037/a0028750> PMID: 22709321
88. Valdez CR, Abegglen J, Hauser CT (2013) Fortalezas familiares program: building sociocultural and family strengths in latina women with depression and their families. *Fam Process* 52: 378–393. <https://doi.org/10.1111/famp.12008> PMID: 24033237
89. Beeber LS, Holditch-Davis D, Perreira K, Schwartz TA, Lewis V, et al. (2010) Short-term in-home intervention reduces depressive symptoms in Early Head Start Latina mothers of infants and toddlers. *Res Nurs Health* 33: 60–76. <https://doi.org/10.1002/nur.20363> PMID: 20043296
90. Wildsmith E, Ansari A, Guzman L. Improving data infrastructure to recognize Hispanic diversity in the United States. National Research Center on Hispanic Children and Families; 2015. Available from: [https://www.childtrends.org/wp-content/uploads/2015/06/Measure-Brief\\_Final.pdf](https://www.childtrends.org/wp-content/uploads/2015/06/Measure-Brief_Final.pdf)
91. Cohen J, Onunaku N, Clothier S, Poppe J. Helping young children succeed: Strategies to promote early childhood social and emotional development; 2005. Available from: <https://www.zerotothree.org/resources/136-helping-young-children-succeed-strategies-to-promote-early-childhood-social-and-emotional-develop>