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Ph.D. THESIS

Maternal Mental Health, Early Relational Processes and Children's Socio-Emotional Development

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CLUJ NAPOCA
2026

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CHAPTER I. THEORETICAL FRAMEWORK

1.1 Conceptual Context

1.1.1 The Sensitive Developmental Window: The First 1000 Days of Life

The first 1000 days of human life are essential for both physical and brain development, with long-term effects throughout life (Aguayo & Britto, 2024). Neuroimaging research shows that the total volume of the brain is growing by 101% in the first year and by 15% in the second year, a process driven mainly by the gray matter, which supports essential functions like synaptogenesis and neurotransmitter synthesis (Gilmore et al., 2018; Zhang et al., 2019). The progressive maturation of the prefrontal cortex, in interaction with limbic structures such as the amygdala, allows for the gradual transition from external emotional regulation to the emergence of emotional self-regulation (Leisman et al., 2025).

One of the most important characteristics of brain development during this period is its increased plasticity, which favors rapid adaptation to environmental inputs but also confers increased vulnerability to adverse experiences (Indrio et al., 2023). Positive early experiences, including nurturing and responsive caregiving, support adaptive synaptic growth and the refinement of neural circuits essential for healthy emotional development (Kumsta, 2023). Importantly, the mental health of parents in the perinatal and postnatal periods is a key contextual factor that influences children's early development, influencing caregiving skills and potentially increasing the risk of children's emotional and behavioral difficulties (McLean et al., 2024).

1.1.2 Socioeconomic Inequalities and Child Development in Low- and Middle-Income Countries (LMICs)

Although the importance of the first two years of life is universally valid, the conditions in which children develop vary a lot. In the context of LMICs, children are often exposed simultaneously to cumulative risk factors, such as malnutrition and poverty, with direct implications for cognitive and socio-emotional development (Grantham-McGregor et al., 2007). The majority of children around the world (over 90%) are born in LMICs, where exposure to multiple risk factors is the norm, not the exception (Kieling et al., 2011; Black et al., 2017). A methodological and ethical problem arises in developmental psychology: many of the studies and empirical data come from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) countries, which in fact represent a bubble, the minority (Henrich et al., 2010; Arnett, 2016). We cannot extrapolate the results from the WEIRD populations to the global child population, as children's development unfolds within different ecological contexts. The present thesis attempts to address this by integrating data from eight countries from different corners of the world.

1.1.3 Maternal Mental Health in Early Child Development

In the first 1000 days of the child's life, the mother plays a central role in mediating the environment, shaping the social and emotional world of the child (Rocha et al., 2020). Perinatal depression remains underdetected in clinical practice, with estimates suggesting that nearly half of all cases go undiagnosed, driven largely by social stigma and by mothers' hesitancy to report symptoms (Carlson et al., 2025). A large meta-analysis (Roddy Mitchell et al., 2023) indicates a global prevalence of perinatal depression of 24.7%, highest in LMICs (25.5%). Maternal depression can affect the mother's ability to interact sensitively with the infant, lower her emotional engagement, and create difficulties in accurately interpreting and responding to the child's cues (McAndrew, 2019; Firk, 2025).

In LMICs, stigma, practical constraints, and limited access to treatment contribute to underdiagnosis and delayed access to care, increasing the likelihood that depressive symptoms will interfere with caregiving practices (Pokharel et al., 2023; Semrau et al., 2015). Beyond this, perinatal depression should also be understood through the lens of socio-economic conditions and family dynamics in LMICs, where intimate partner violence, economic insecurity, and gender inequalities create contexts characterized by stress and lack of control, which affect the emotional balance of mothers (Gelaye et al., 2016; Raghavan et al., 2022). Therefore, it is crucial to comprehend how, when, and under what conditions maternal depression translates into developmental risk.

1.2 Research Rationale and Significance

The present thesis is motivated by the need to address two important limitations in the current literature. The first concern is the limited global representativeness of the existing evidence: a considerable proportion of the research continues to be based on WEIRD populations, creating an important gap in our understanding of whether the available information adequately captures the realities of LMICs (Henrich et al., 2010; Kieling et al., 2011).

The second limitation lies in the fact that the existing literature still does not explain in sufficient depth the pathways through which maternal depression may become relevant in settings marked by social and economic problems (Morales et al., 2023; Frost et al., 2025). The rationale of the present thesis is therefore not limited to demonstrating that maternal mental health matters, but rather to clarify how, when, and under what conditions it matters (Goodman et al., 2020). This requires moving beyond prevalence and single exposure-outcome associations and toward a more integrated examination of the relational, behavioral, and contextual pathways through which maternal depressive symptoms may influence children's early developmental environments. In this

sense, the present thesis integrates variables that reflect different but interconnected aspects of the child's early developmental ecology: caregiving behaviors such as breastfeeding exclusivity, relational processes such as maternal-fetal attachment and mind-mindedness, and relational outcomes such as mother-child relationship quality (Morales et al., 2023; Corapci et al., 2024).

Another important rationale is the attention to developmental timing within a longitudinal framework, understanding maternal depression not as a fixed condition, but as a dynamic process whose developmental significance may vary across the first years of life. If maternal distress becomes salient through caregiving behaviors and relational dynamics, these domains themselves may represent targets for support, with direct implications for prevention and early intervention even in settings where specialized mental health care is limited (Frost et al., 2025; Humphreys et al., 2024).

1.3 Current State of Knowledge

1.3.1 Socio-Ecological Model

The present thesis adopts an ecological perspective, using the Socio-Ecological Model (SEM) (Bronfenbrenner, 1979; Kilanowski, 2017), emphasizing that development unfolds within environmental systems rather than in isolation. A public health adaptation of SEM (Collins et al., 2024) organizes influences on mental health into six levels: individual, relationships, organizations, community, policy, and society. In this thesis, maternal depressive symptoms are positioned at the Individual level (mother), child socio-emotional development also at the Individual level (child), and the pathways linking these constructs are examined mainly within the Relationships and Communities domains. The relational domain includes breastfeeding exclusivity, maternal-fetal attachment, mind-mindedness, and mother-child relationship quality; the community domain is captured through neighbourhood cohesion, closure, and disorder. The

temporal dimension of the model is reflected in the longitudinal design from pregnancy through early infancy to toddlerhood (Chronosystem).

1.3.2 Maternal Depressive Symptoms as a Longitudinal Exposure

In the present thesis, maternal depression is approached through depressive symptoms measured continuously, rather than through categorical diagnosis, consistent with the use of self-report scales in community and LMIC settings, where even subthreshold symptoms may still have developmental relevance (Gyimah et al., 2024; Cerniglia et al., 2020). Longitudinal studies suggest that maternal depressive symptoms may be associated in different ways with child development depending on when they begin to occur and whether they persist over time, these patterns highlight a key limitation of single-time-point studies: they cannot distinguish whether risk reflects a short episode or a longer exposure that shapes the caregiving context over time (Evans et al., 2012; Rogers et al., 2020). Meta-analytic evidence indicates that maternal perinatal depression is associated with children's socio-emotional development from infancy through adolescence, and maternal depressive symptoms may become linked to child outcomes through multiple caregiving and relational pathways, including breastfeeding exclusivity, maternal-fetal attachment, maternal representations, and mind-mindedness (Dias & Figueiredo, 2015; McMahon & Bernier, 2017; Davis et al., 2020).

1.3.3 Caregiving in Early Development

Responsive caregiving (the caregiver's capacity to notice the child's cues, interpret them adequately, and respond promptly and appropriately) is widely described as a central component of early caregiving (Nurturing Care for Early Childhood Development, 2018; Jeong et al., 2022). Meta-analytic evidence shows that caregiver sensitivity is associated with attachment security (Madigan et al., 2024), fewer socio-emotional and behavioral difficulties, and better early language

development, with stronger associations often found in longitudinal studies and in contexts with lower socioeconomic resources (Madigan et al., 2019). Variation between cultures is substantial, caregiving practices being shaped by ecological demands and cultural norms regarding autonomy, relatedness, and socialization (Daelmans et al., 2021).

1.3.4 Breastfeeding Exclusivity

Exclusive breastfeeding is one of the earliest caregiving behaviors in a child's life, providing not only nutrition but also repeated opportunities for closeness, soothing, and dyadic regulation between mother and child (Kim et al., 2024). In this sense, breastfeeding exclusivity can be understood not only as a feeding practice, but also as an early caregiving behavior through which maternal emotional functioning may become visible in the child's developmental environment (Modak et al., 2023). Recent evidence supports the idea that maternal depressive symptoms can be associated with a lower likelihood of exclusive breastfeeding, including in LMIC contexts (Misgana et al., 2024; Neupane et al., 2025), an association driven by reduced maternal self-efficacy and difficulties in interpreting infant cues (Bates et al., 2020; Firk, 2025). At the same time, evidence suggests the association may not be strictly unidirectional: breastfeeding has been linked with lower depressive symptoms in some studies, whereas this pattern may weaken or reverse when breastfeeding is experienced as stressful or difficult (Xia et al., 2022; Kim et al., 2022).

1.3.5 Maternal-Fetal Attachment

Maternal-fetal attachment can be understood as the early relational bond that develops during pregnancy, reflecting the extent to which the mother begins to think about the fetus as a separate individual, becomes emotionally involved, and starts to orient herself toward the future mother-child relationship (McNamara et al., 2019; Cervellione et al., 2025). The literature suggests

that maternal-fetal attachment is a foundational relational component rather than a transient prenatal feeling: stronger attachment has been associated with more positive bonding-related outcomes, better parent-infant interactions, and implications for children's later emotional and behavioral functioning (Foley & Hughes, 2018; Arguz Cildir et al., 2020). A meta-analysis on predictors suggests that gestational age and social support emerge as the most consistent correlates, while depressive and anxiety symptoms tend to show smaller associations (Yarcheski et al., 2009). Within this framework, maternal-fetal attachment becomes relevant as a prenatal relational process that may help explain how maternal mental health can be connected to postnatal caregiving behaviors such as breastfeeding.

1.3.6 Maternal Representations in the Early Mother-Child Relationship

Maternal representations - the meanings, expectations, and relational assumptions through which the child is perceived, are an important component of the early mother-child relationship (Bretherton & Munholland, 2008; Simkiss et al., 2013). Less balanced or more negatively toned representations have been linked to less sensitive and more atypical patterns of caregiving behavior (Sokolowski et al., 2007; Korja et al., 2010). Maternal distress, including depressive symptoms, has been associated more often with more negatively toned or more strained perceptions of the child and the relationship. However, these findings should be interpreted with caution, as representations are shaped not only by maternal emotional functioning, but also by child characteristics and the wider relational and contextual environment (Oates et al., 2018).

1.3.7 Mind-Mindedness in the Early Mother-Child Relationship

Mind-mindedness (MM) refers to the mother's tendency to view the child as a psychological agent with thoughts, emotions, desires, and intentions that are meaningful for interaction (Meins et al., 2003). MM occupies an intermediate position between the

representational and the behavioral dimensions of the mother-child relationship, emphasizing both how the child is understood in the mother's mind and how this understanding is expressed through mothers' spontaneous talk about the child (McMahon & Bernier, 2017). Meta-analytic evidence suggests that MM is modestly associated with children's developmental functioning across several domains, including theory of mind, social cognition, and aspects of language and executive functioning (Aldrich et al., 2021). Regarding its association with maternal depression, a recent meta-analysis shows that parental depressive symptoms are only weakly associated with lower parental mentalizing overall, while no significant associations were found for MM specifically (Georg et al., 2023), suggesting that the role of depressive symptoms in MM is not yet fully understood and that more studies are needed (Corapci et al., 2024).

1.3.8 Socio-Emotional Development of the Child

Socio-emotional development at two years is a broad and multidimensional domain, which includes both positive competencies, such as prosocial behavior, and problematic variations, such as internalizing difficulties (anxiety, withdrawal, sadness, fearfulness) and externalizing difficulties (aggression, oppositional behavior, impulsivity) (Malik & Marwaha, 2022; Tandon et al., 2009; Tremblay et al., 2004). This multidimensional view is relevant in the context of maternal depression, because early socio-emotional adjustment appears to be sensitive to maternal psychological difficulties. Meta-analytic evidence suggests that parental depression is associated with both internalizing and externalizing problems in children, although these associations are generally small (Ivanova et al., 2022). The developmental impact of maternal depression may vary depending on whether symptoms occur prenatally, postnatally, or across both periods — timing appears to matter, as prenatal depression may affect development through antenatal mechanisms,

whereas postnatal depression may become particularly relevant through its influence on the early relational environment (Takacs et al., 2020; Morales et al., 2023).

1.3.9 Community Characteristics

Beyond individual and dyadic processes, maternal depression should also be understood within the relational and community context in which pregnancy, childbirth, and early caregiving take place (Bedaso et al., 2021). A systematic review and meta-analysis by Bedaso et al. (2021) showed that low social support is a significant risk factor for antenatal depression, while support from partners, family, and wider social networks may play an important protective role. Social cohesion, trust, reciprocity, and opportunities for social participation may function as protective community resources (Zhou et al., 2018; Hatakeyama et al., 2024), whereas neighbourhood disorder may reflect a more adverse community context relevant for maternal vulnerability during pregnancy and early caregiving (Subiza-Perez et al., 2021). Community characteristics are relevant for the present thesis not only because they may shape maternal depression, but also because they form part of the wider relational context in which early caregiving and child development take place.

CHAPTER II. RESEARCH OBJECTIVES AND GENERAL METHODOLOGY

2.1 Research Objectives

2.1.1 General Objective

The general objective of the present thesis is to study, within a socio-ecological framework, how maternal depressive symptoms from pregnancy to early childhood are associated with maternal caregiving behaviors, mother–child relationship quality, and children’s socio-emotional development, as well as the individual, relational, and community factors that may shape these associations.

2.1.2 Specific Objectives

1. To synthesize, through an up-to-date meta-analysis, the association between maternal depressive symptoms and children's socio-emotional development in the first two years of life, and to explore the potential moderating variables of this relationship.
2. To study whether maternal–fetal attachment and postnatal depressive symptoms mediate the association between prenatal depressive symptoms and breastfeeding exclusivity.
3. To study longitudinally the association between changes in maternal depressive symptoms across the perinatal period and early childhood and mother–child relationship quality at 24 months, assessed through perceived warmth and invasion and mothers' mind-related descriptions of the child, as well as the relational, and community factors that may influence this association.
4. To study longitudinally the association between changes in maternal depressive symptoms across the perinatal period and early childhood and children's socio-emotional development at 24 months, as well as the relational, and community factors that may influence this association.

2.2 General Methodology

2.2.1 Design

The present thesis is composed of four studies and combines two complementary methodological approaches. First, it includes a meta-analytic design, used in Study 1 to synthesize existing evidence and examine potential moderators of the association between maternal depression and children's socio-emotional development at 24 months. Second, Studies 2, 3 and 4 adopt a prospective longitudinal design, with three waves of measurement: during the third trimester of pregnancy (W1), when children were between 3 and 6 months old (W2), and when children were approximately 24 months old (W3). The longitudinal component draws on data

collected in collaboration with the Evidence for Better Lives Study (EBLS), an international project collecting data in eight LMI countries in the first two waves and six countries in the third wave. The author of the thesis co-coordinated the study design, data collection, and training procedures during Waves 2 and 3 across the participating countries.

2.2.2 Procedure

The study aimed to achieve a sample that included diverse social backgrounds within each study area. Recruitment locations included Kingston (Jamaica), Koforidua (Ghana), Worcester (South Africa), Cluj-Napoca (Romania), Tarlai Kalan (Pakistan), Ragama (Sri Lanka), Hue (Vietnam), and Valenzuela (the Philippines). Pregnant women were eligible if they were in the third trimester of pregnancy (28-40 weeks), were 18 years of age or older, had their main residence within the study area, and were able to provide written informed consent. Questionnaires were administered via CAPI and A-CASI tablets. The final wave was conducted via phone interviews due to the COVID-19 pandemic. All instruments were translated and adapted into participants' native languages using an internal standardized protocol (WHO, 2014), and the study was approved by the ethics committees of the University of Cambridge and the universities/research institutes in each country.

2.2.3 Participants

Participants were women who met the inclusion criteria and provided informed consent. As the thesis includes multiple empirical studies derived from the same larger longitudinal dataset, the participant samples differed across studies depending on the availability of the relevant variables and the specific aims of each analysis. Detailed information regarding the participants included in each study, including sample size and relevant sociodemographic characteristics, is presented separately in the chapter corresponding to each specific study.

2.2.4 Measures

The measures used throughout the longitudinal study are described comprehensively in this chapter to maintain methodological coherence. Depressive symptoms were assessed at all three waves using The Patient Health Questionnaire-PHQ-9 (Kroenke et al., 2001), a 9-item self-report measure based on DSM-IV criteria with acceptable internal consistency across waves ($\alpha = .76$, $.74$, and $.84$, respectively). Maternal-fetal attachment was assessed at W1 using the Prenatal Attachment Inventory-Revised (PAI-R; Pallant et al., 2014), an 18-item scale with excellent internal consistency ($\alpha = .93$). Mother-child relationship quality was assessed at W3 using the Mothers' Object Relations Scales Short-form (MORS-SF; Oates et al., 2018), covering the "warmth" ($\alpha = .76$) and "invasion" ($\alpha = .73$) dimensions. Mind-mindedness was assessed at W3 via the Three Minutes Speech Sample (TMSS; adapted from FMSS), coding mental and non-mental comments from mothers' spontaneous speech about their child (Meins & Fernyhough, 2015). Mothers were asked to speak freely about their child for three minutes, and the narratives were later coded for references to the child's thoughts, emotions, desires, intentions, and other internal states. Consistent with previous MM research, the coding focused on the proportion of appropriate mental state references relative to total comments. Community characteristics were assessed at W1 across three dimensions: neighbourhood cohesion ($\alpha = .83$; Mujahid et al., 2007), intergenerational closure ($\alpha = .63$; Sampson et al., 1999), and neighbourhood/social disorder ($\alpha = .89$; Marco et al., 2015). Breastfeeding exclusivity was assessed at W2 via a single item from the UNICEF/WHO Questionnaire for Breastfeeding Mothers (2009). Children's socio-emotional development was assessed at W3 using the Social Behaviour Questionnaire (SBQ; Tremblay et al., 1991), which includes the following subscales: ADHD-related behaviours ($\alpha = .66$), prosocial behaviour ($\alpha = .78$), internalising problems ($\alpha = .58$), and aggression ($\alpha = .74$).

CHAPTER III. ORIGINAL RESEARCH CONTRIBUTIONS

3.1 Study 1: Maternal Depression and Children's Socio-Emotional Development in the First Two Years of Life: A Meta-Analysis¹

3.1.1 Introduction

The first two years of life are a sensitive period for cognitive, social, and emotional development, laying the foundation for long-term psychological adjustment (Ilyka et al., 2021; Likhar et al., 2022). Socio-emotional development in this period encompasses three main areas: emotion regulation, other-oriented socio-emotional processes, and self-oriented socio-emotional processes (Denham & Zinsser, 2014). These socio-emotional processes are interconnected and support children's ability to understand others, regulate emotions, and form functional relationships with caregivers and others (Paley & Hajal, 2022; Thümmeler et al., 2022; Speidel et al., 2023; Malik & Marwaha, 2022).

Early socio-emotional skills predict important long-term outcomes, including educational and economic opportunities, support positive relationships and adaptive functioning, and act as protective factors against internalizing and externalizing difficulties (Jones et al., 2015; Frosch et al., 2021; Anderson et al., 2023). In the present study, socio-emotional development is operationalized as a measure spanning both adaptive competencies (emotion regulation, social competence, prosocial behavior) and emerging difficulties (internalizing, externalizing symptoms), consistent with Halle and Darling-Churchill (2016).

¹ This study was published as Costin, M. R., Tăut, D., Băban, A. S., & Pinte, S. (2026). Maternal Depression and Children's Socio-Emotional Development in the First Two Years of Life: A Meta-Analysis. *Journal of Evidence-Based Psychotherapies*, 26(1), 39-68. DOI: 10.24193/jebp.2026.1.3

From an ecological perspective (Bronfenbrenner & Morris, 2007), children's development is shaped by interrelated systems ranging from broad socio-cultural structures to immediate family interactions. A particularly crucial microsystem component is the parent-child relationship, which begins before birth and continues to shape socio-emotional growth (Bianciardi et al., 2023). One key factor affecting this dynamic is maternal depression in the perinatal period (Goeglein & Yatchmink, 2020; Morales et al., 2023).

Prenatally, depressive symptoms can disrupt the hypothalamic-pituitary-adrenal (HPA) axis, increasing fetal stress sensitivity and risk of adverse birth outcomes associated with long-term developmental deficits (Beijers et al., 2014; Ghimire et al., 2021). Postnatally, depressed mothers may withdraw, become less responsive to children's cues, and struggle to establish warm caregiving routines (Letourneau et al., 2010; McAndrew, 2019). These disruptions elevate children's risk of poor emotion regulation and internalizing and externalizing problems (Goodman et al., 2011; Urizar & Muñoz, 2022; Morales et al., 2023).

The relationship between maternal depression and early socio-emotional development is multifaceted, involving cultural, socioeconomic, relational, and biological factors (Cui et al., 2018; Chorbajian et al., 2020). Individual studies differ substantially in design, timing of assessment, and outcome measures, making it difficult to draw clear conclusions regarding the impact of maternal depression on children's socio-emotional development during the first two years of life (Cuijpers et al., 2010; Morales et al., 2023). Therefore, a meta-analytic synthesis is needed to evaluate the effects of prenatal and postnatal depression and identify potential moderators of association (Rogers et al., 2020; Takács et al., 2020).

This meta-analysis aimed to examine the association between maternal depression and children's socio-emotional development during the first two years of life by: (1) quantifying the

overall effect of maternal depression; (2) differentiating prenatal and postnatal effects; and (3) exploring methodological and sociodemographic moderators.

3.1.2 Methods

3.1.2.1 Search Strategy

We followed the PRISMA guidelines (Page et al., 2021). A comprehensive search was conducted up to 01 December 2025 in PubMed, Web of Science, and Scopus using combinations of terms related to maternal depression (e.g., "postnatal depression," "postpartum depression," "prenatal depression") combined via Boolean AND with terms for child socio-emotional development. Two authors independently assessed final study eligibility, with disagreements resolved by the senior author.

3.1.2.2 Inclusion and Exclusion Criteria

Studies were included if they: were published English-language articles; examined the relationship between maternal depression and children's socio-emotional development; employed validated measurements; and provided sufficient statistics for effect size computation. Exclusion criteria were: reviews and book chapters; outcomes assessed in children older than 24 months; studies focused on cognitive/physical outcomes, other caregivers' mental health, or adopted children; and studies where socio-emotional development was discussed but not directly measured. The selection process is illustrated in the flowchart diagram in Figure 1.

3.1.2.3 Coding Procedure and Moderators

From each study we extracted: study design, sample size, effect sizes, and related statistical information. Depression variables were coded according to timing (prenatal vs. postnatal), assessment instrument, type of measurement (e.g., self-reported), and timing of assessment when available. Children's socio-emotional development variables were coded according to the

assessment instrument, type of measurement (observational vs. maternal-report), and timing of outcome assessment. Moderators retained for analysis included maternal age, percentage of mothers with >12 years of education, percentage of mothers living with a partner, and percentage of primigravida mothers.

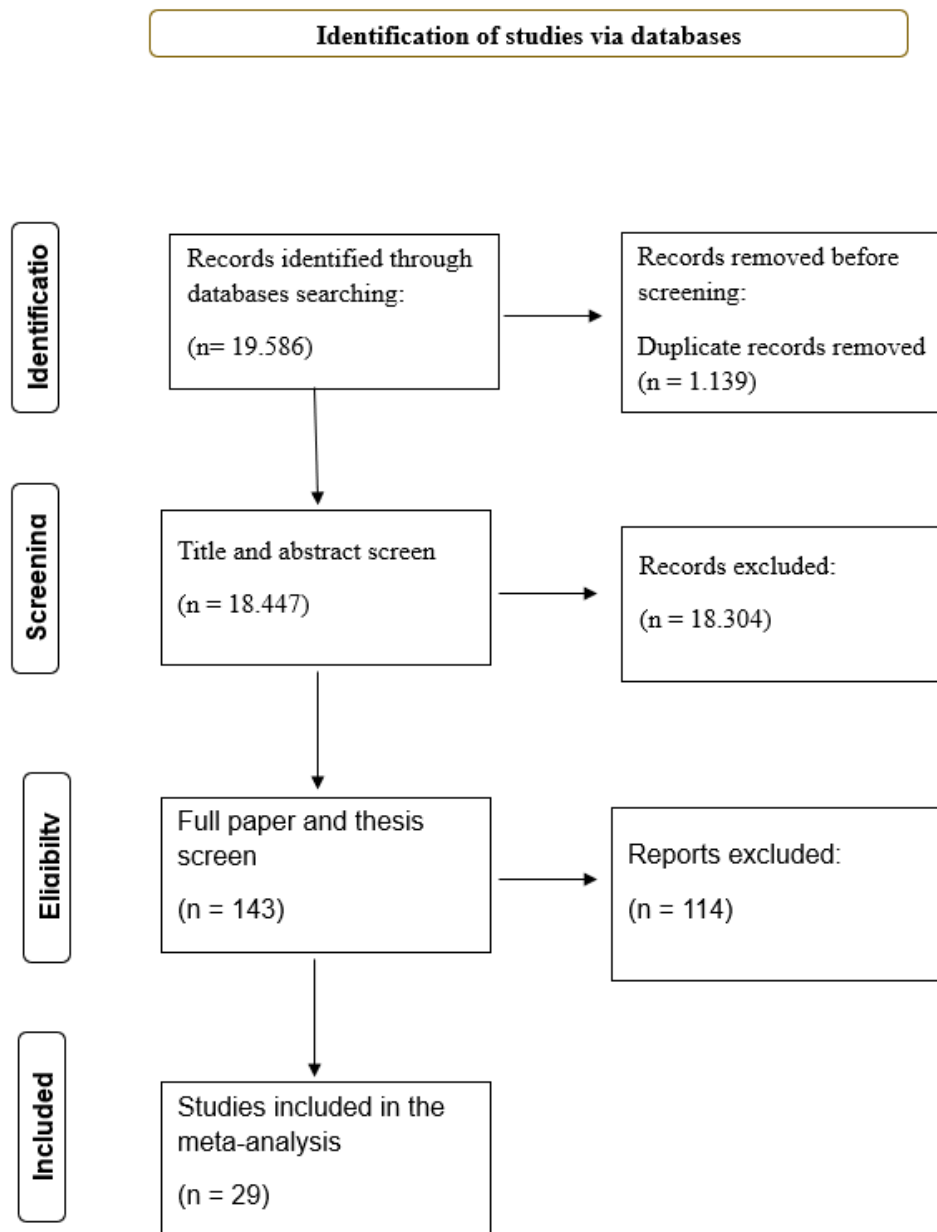


Figure 1. The PRISMA flow chart diagram describing the selection of studies.

3.1.2.4 Study Quality and Outcome Direction

Study quality was assessed using the Newcastle–Ottawa Scale (NOS; Wells et al., 2013), adapted for cohort and cross-sectional designs, and expressed as a percentage of the maximum score. To ensure analytical consistency, correlations were recoded such that associations congruent with the literature (i.e., higher maternal depression associated with poorer child socio-emotional outcomes) received a positive sign. This decision was made to prevent positive correlations with child problems from canceling out negative correlations with child competencies if the original signs were retained. Original signs were retained only when outcome type (competencies vs. problems) was examined as a moderating variable.

3.1.3 Data Analysis

Analyses were conducted using Comprehensive Meta-Analysis software, version 2, with a random-effects model given the studies' heterogeneity. Publication bias was evaluated using Rosenthal's Classic Fail-safe N (Rosenthal, 1979), Begg and Mazumdar's rank correlation test (Begg & Mazumdar, 1994), and visual funnel plot inspection. For moderator analyses, we used heterogeneity tests for categorical variables (e.g., depression phase) and meta-regression for continuous variables (e.g., mothers' age) (Borenstein et al., 2021).

3.1.4 Results

3.1.4.1 Study Characteristics

The meta-analysis included 29 independent studies with a combined sample of 22,655 mother-child dyads (range 10–12,130 per study). The majority used a longitudinal design ($n = 24$); five were cross-sectional. Studies were geographically diverse but Western-predominant: North America ($n = 12$), Europe ($n = 9$), Asia ($n = 3$), Oceania ($n = 2$), South America ($n = 1$), Africa ($n = 1$), and Turkey ($n = 1$). Maternal depression was assessed prenatally in 4 studies, postnatally in

17, and at both phases in 8. All studies used validated self-report measures; EPDS was most common for both prenatal ($n = 7$) and postnatal ($n = 13$) assessments. Child socio-emotional development was measured between 1 and 112 weeks post-birth (median = 57 weeks), predominantly via maternal report ($n = 23$), with the most common instruments being BITSEA ($n = 7$), CBCL ($n = 5$), and the Bayley Scales ($n = 6$).

3.1.4.2 Heterogeneity Analysis

The heterogeneity analysis performed for the distribution of effect sizes in the meta-analysis indicated significant heterogeneity, $Q(28) = 369.45$, $p < .001$, $I^2 = 92.42$. Taking into account also the diversity related to the research designs and participants, we decided to perform all data analysis using a random-effects model.

The overall effect size is presented in Figure 2. As can be seen, the correlation varies from -0.24 (Nix et al., 2021) to 0.914 (Kamal & Kalita, 2010). The overall effect size is $r = 0.204$, 95% CI $[0.147, 0.260]$, and statistically significant ($Z = 6.86$, $p < 0.001$), indicating a small to moderate effect size between maternal depression and children's socio-emotional development during the first two years of life.

3.1.4.3 Publication Bias Analysis

Publication bias was examined using three methods. The Classic Fail-safe N (Rosenthal, 1979) indicated that 2,902 null studies would be needed to nullify the observed effect (100.1 per included study), suggesting robust findings. Begg and Mazumdar's rank correlation yielded a non-significant Kendall's tau b of 0.21 , with a two-tailed p value of 0.106 (based on continuity-corrected normal approximation), with no systematic tendency for larger studies to produce larger effects. Visual inspection of the funnel plot (Figure 3) showed a largely symmetrical distribution

around the pooled effect size, with modest right-side imbalance attributable to natural heterogeneity rather than systematic bias.

Figure 2.

The forest plot of all studies included in the analysis and the overall effect size.

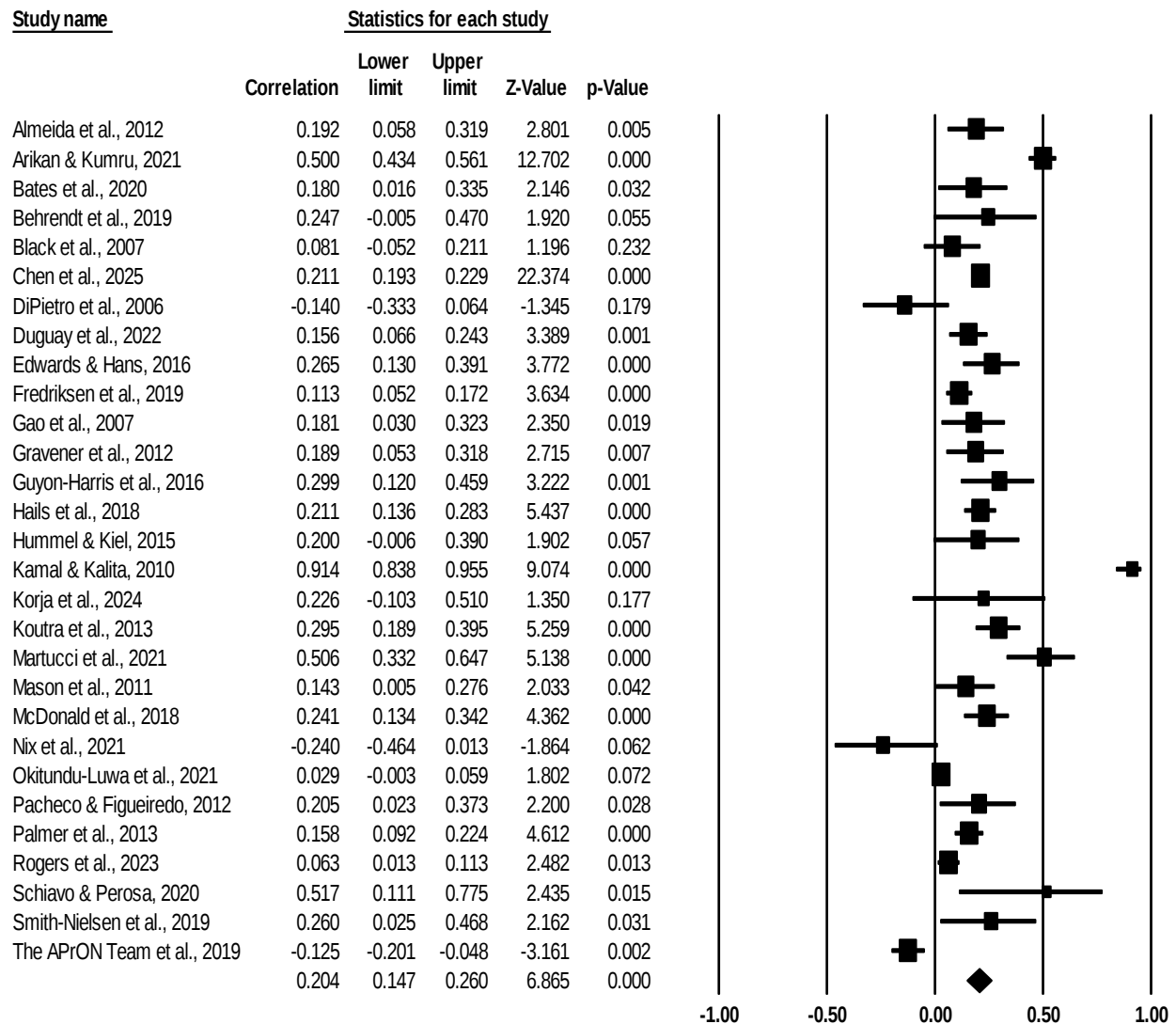
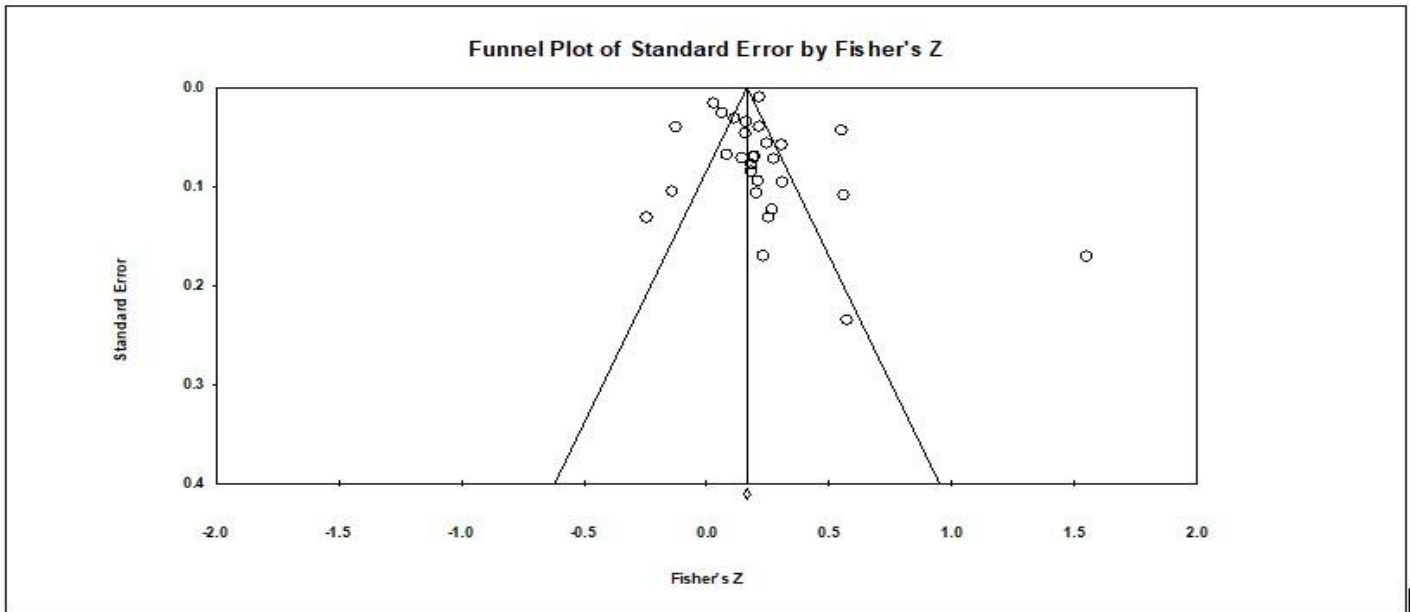


Figure 3.
Funnel plot for the studies included in the meta-analysis.



3.1.4.4 Moderators Analysis

Depression phase. Table 1 presents the comparison between the overall effect size obtained in the prenatal phase and the overall effect size obtained in the postnatal phase of maternal depression. The effect sizes obtained in the prenatal and the postnatal phases are both statistically significant ($r = 0.14$, $p = 0.001$ for the prenatal phase; $r = 0.22$, $p = 0.001$ for the postnatal phase), with no statistically significant differences between them $Q(1) = 3.027$, $p = 0.070$. Consequently, the depression phase does not moderate the effect size.

Table 1.
Comparison of effect sizes between postnatal and prenatal maternal depression

Phase of measurement	No. of studies	r	Limits of confidence interval (95%)		Z	p
			Lower	Upper		
Postnatal	25	0.229	0.157	0.298	6.12	0.001
Prenatal	12	0.141	0.076	0.204	4.26	0.001

Socio-emotional development measurement (observational vs. reported by mother).

Table 2 presents the analysis of the effect sizes as a function of the children's socio-emotional development measurement method. When the measurement was observational, the effect size was small and non-significant ($r = 0.101$, $p = 0.079$). When children's socio-emotional development was reported by mothers, the effect size was moderate and statistically significant ($r = 0.225$, $p < .001$). The heterogeneity test between categories revealed marginally statistically significant differences, $Q(1) = 3.60$, $p = 0.058$. Consequently, the way the outcomes were measured tends to moderate its relationship with maternal depression.

Table 2.

The analysis of the effect sizes as a function of the children's socio-emotional development measurement method (observational vs. reported by mother).

Children's socio-emotional development measurement	No. of studies	r	Limits of confidence interval (95%)		Z	p
			Lower	Upper		
Observational	6	0.101	-0.012	0.212	1.75	0.079
Reported by mother	23	0.225	0.161	0.286	6.81	<.001

Children's socio-emotional development time (weeks post-birth). The moderation analysis for outcome time was performed using a meta-regression procedure in which the outcome time was treated as a predictor and the effect size as a criterion. A total of 28 studies reported the timing of the outcome, and to standardize the data, all reported times were transformed into weeks. The analysis revealed that the outcome time is a significant positive predictor of the effect size ($b = 0.004$, $Z = 2.95$, $p = 0.003$). This finding suggests that as the time of outcome measurement increases, the strength of the relationship between maternal depression and child outcomes also increases. Therefore, outcome time plays a significant moderating role in this relationship.

Mother's age. Because most of the studies did not report their results as a function of age, we quantified the mean age of mothers and tested through a meta-regression whether it predicted the effect size from each study. The analysis revealed that age was a significant negative predictor of the effect sizes ($b = -0.015$, $Z = -6.37$, $p < .001$). This finding suggests that as the age of the mother increases, the strength of the relationship between maternal depression and children's socio-emotional outcomes decreases. Thus, the mother's age is an important moderating variable in understanding this relationship.

Percentage of mothers with more than 12 years of education. The moderation analysis was conducted using a meta-regression procedure, with education level as the predictor and effect size as the criterion. The analysis revealed that the percentage of mothers with higher education was a significant negative predictor of the effect size ($b = -0.0009$, $Z = -3.99$, $p < .001$). Thus, as the percentage of mothers with more than 12 years of education increases, the effect size decreases. Therefore, the level of maternal education moderates the relationship between depression and child socio-emotional development.

Percentage of mothers living with a partner. A meta-regression was conducted to assess the percentage of mothers living with a partner as a potential moderator. The results showed that this variable was a significant negative predictor of the effect size ($b = -0.002$, $Z = -8.80$, $p < .001$). This suggests that as the percentage of mothers living with a partner increases, the effect size decreases. Consequently, the relationship between maternal depression and child outcomes is moderated by whether the mother is living with a partner.

Percentage of primigravida mothers. The meta-regression analysis for the percentage of primigravida mothers revealed that this variable was not a significant predictor of the effect size

($b = 0.0002$, $Z = 0.61$, $p = 0.539$). Therefore, no evidence was found that primigravida status moderates the relationship between maternal depression and child socio-emotional outcomes.

Competencies vs. problems. Table 3 presents the effect size as a function of whether the socio-emotional outcome reflected competencies or problems. When competencies were correlated with maternal depression, the effect size was small and significant ($r = -0.142$, $p = 0.048$). When problems were associated with depression, the effect size was small to moderate and statistically significant ($r = 0.206$, $p < .001$). The heterogeneity test between categories revealed statistically significant differences, $Q(1) = 18.56$, $p < .001$. Consequently, the type of outcome (competencies vs. problems) moderates its relationship with depression.

Table 3.

The effect size as a function of competencies vs problems

Competences vs problems	No. of studies	r	Limits of confidence interval (95%)		Z	p
			Lower	Upper		
Competences	13	-0.142	-0.278	-0.001	-1.97	0.048
Problems	17	0.206	0.134	0.276	5.54	<.001

Study quality. The meta-regression analysis indicates that study quality was a statistically significant predictor of effect size, with a positive regression coefficient ($B = 0.001$, $Z = 4.49$, $p < .001$). This suggests that higher-quality studies tended to report slightly larger effect sizes.

3.1.5 Discussion

The present meta-analysis revealed a statistically significant, small-to-moderate association between maternal depression and children's socio-emotional development during the first two years of life, consistent with previous meta-analytic findings (Goodman et al., 2011; Letourneau et al., 2019). Although the postnatal effect was numerically larger, the difference between prenatal and postnatal depression was not statistically significant, supporting the view

that depressive symptoms across the entire perinatal period represent a relevant developmental risk. One possible explanation is the continuity of depressive symptoms across pregnancy and postpartum, such that early symptoms may reflect a more persistent vulnerability. In addition, prenatal and postnatal depression may operate through partially different mechanisms, including prenatal biological sensitization and postnatal caregiving disruptions, that converge on similar socio-emotional outcomes (Beijers et al., 2014; Bind et al., 2022).

3.1.6 Limitations and Future Research

Several limitations should be noted. Most included studies relied on maternal self-report to assess child socio-emotional development, which may introduce negative reporting bias in depressed mothers. The heterogeneity of study designs, measures, and samples limits generalizability; although moderator analyses addressed some variability, unmeasured contextual factors (e.g., social support, cultural norms, father involvement) were not examined. Future research should employ longitudinal designs tracking children from the prenatal period, use multi-informant and observational assessments, and address maternal mental health in more vulnerable subgroups (younger, less-educated, or single mothers).

3.1.7 Conclusions

This meta-analysis highlights the significant impact of maternal depression on the socio-emotional development of children during their first two years of life. The findings underscore the need for early identification and intervention for mothers experiencing depression, as well as monitoring young children whose mothers have experienced perinatal mental health difficulties. By addressing maternal mental health problems as early as possible, we can support children in developing in the most balanced and healthy way from the very beginning.

3.2. Study 2: The Role of Maternal Depression Symptoms and Maternal-Fetal Attachment in Predicting Exclusive Breastfeeding: A Multi-Site Prospective Study²

3.2.1 Introduction

Perinatal depression is a major public health concern affecting 15–65% of pregnant women in low- and middle-income countries (LMICs) (Dadi et al., 2020). Pregnancy is associated with important emotional, psychological, and hormonal changes that may increase vulnerability to prenatal stress and depression (Eberhard-Gran et al., 2002; Chaudron, 2013). Depressive symptoms during pregnancy are associated with adverse fetal and child outcomes, including restricted intrauterine growth and impaired postnatal weight gain (Graganic-Philippe et al., 2014; Ghimire et al., 2021). Perinatal depression may also affect fetal development through prolonged exposure to stress hormones and alterations in the maternal hypothalamic–pituitary–adrenal axis (Duthie & Reynolds, 2013; Estes & McAllister, 2016). Fifty-four percent of women with prenatal depression continue to experience postnatal depressive symptoms (Gelaye et al., 2016), which in turn negatively affect mother–child interaction, attachment, and caregiving including breastfeeding (Brummelte & Galea, 2016; Parsons et al., 2012).

3.2.1.1 Maternal Depression and Breastfeeding

Exclusive breastfeeding confers well-established health benefits for both infants and mothers, including protection against child morbidity and long-term health risks (Section on Breastfeeding, 2005; Bar et al., 2016; Hay & Bærug, 2019; Victora et al., 2016). However,

² This study was published as Costin, M. R., Taut, D., Baban, A., Ionescu, T., Murray, A., Lindsay, C., Secara, E., Abbasi, F., Sarfo Acheampong, I., Katus, L., Luong Thanh Bao, Y., Hernandez, S. C. L. S., Randeny, S., Du Toit, S., Valdebenito, S., & Eisner, M. P. (2024). The Role of Maternal Depression Symptoms and Maternal Attachment in Predicting Exclusive Breastfeeding: A Multisite Prospective Study. *Journal of Women's Health*, 33(2), 187–197. <https://doi.org/10.1089/jwh.2023.0076>

evidence on the depression–breastfeeding link is mixed: some studies find that prenatal depressive symptoms predict shorter breastfeeding duration (Figueiredo et al., 2014; Hahn-Holbrook et al., 2013; Kehler et al., 2009), while others find no significant association (Chung et al., 2004; Haga et al., 2018). Socioeconomic adversity, cultural norms, and lack of support also contribute to early breastfeeding cessation, particularly in LMICs (Gelaye et al., 2016; Tariqujjaman et al., 2022; Tomori, 2022).

3.2.1.2 Maternal–Fetal Attachment

Maternal–fetal attachment (MFA) refers to the affectionate antenatal relationship that develops between a mother and the fetus (Muller & Mercer, 1993). Higher MFA is associated with better postpartum mother–infant attachment (Trombetta et al., 2021), positive health behaviors during pregnancy, better maternal adjustment to the caregiving role, and longer breastfeeding duration (Scharfe, 2012). Prenatal depression is negatively associated with MFA (Rollè et al., 2020). Despite increasing evidence linking maternal depression, MFA, and breastfeeding, relatively few longitudinal studies have examined these relationships in LMICs. The main aim of this study was to test the mediating role of MFA and postnatal depression in the relationship between prenatal depression and exclusive breastfeeding in mothers from eight LMICs.

3.2.2 Methods

3.2.2.1 Participants and Procedure

We recruited approximately 150 pregnant women per site in eight LMICs: Jamaica, Ghana, South Africa, Romania, Pakistan, Sri Lanka, Vietnam, and the Philippines (N = 1185 final total at baseline). Inclusion criteria required mothers to be in the third trimester of pregnancy (weeks 28–40), aged 18 or older, and planning to remain in the study area. Wave 1 was conducted in the third trimester; Wave 2 was conducted 3–6 months postpartum (n = 1054). Participants were recruited

from local health centers and completed tablet-based interviews (CAPI/A-CASI). The study was approved by the University of Cambridge ethics committee and local institutions in each country.

3.2.2.2 Measures

Depression was assessed using the PHQ-9 (Kroenke et al., 2001), a 9-item self-report instrument scored 0–27, with cut-points of 5, 10, 15, and 20 representing mild, moderate, moderately severe, and severe depression. Internal consistency was acceptable (prenatal $\alpha = .76$; postnatal $\alpha = .73$). MFA was assessed using the Prenatal Attachment Inventory-Revised (PAI-R; Pallant et al., 2014), an 18-item instrument with three subscales (Anticipation, Interaction, Differentiation) scored 18–72; the current study showed excellent internal consistency ($\alpha = .93$). Breastfeeding exclusivity was assessed at Wave 2 using one item from the Questionnaire for Breastfeeding Mothers (UNICEF/WHO, 2009): "How are you feeding your baby?" Covariates included maternal age, education, SES (composite household score), and child birth weight, length, and head circumference.

3.2.3 Data Analysis

Data were analyzed using IBM SPSS v25 and IBM AMOS v20. Missing data were single imputed using the regression method. Path analysis with maximum likelihood estimation was used to assess a parallel mediation model in which MFA and postnatal depression were tested as mediators of the relationship between prenatal depression and breastfeeding exclusivity. Model fit was evaluated using $SRMR \leq 0.08$, $RMSEA \leq 0.06$, and $CFI/TLI \geq .95$ (Hu & Bentler, 1995). Indirect effects were estimated via bootstrapping (5000 samples). An unconstrained multigroup mediation model was tested across the eight sites.

3.2.4 Results

3.2.4.1 Descriptive Statistics

After excluding 23 participants who did not meet inclusion criteria, the final baseline sample was $N = 1185$ (M age = 28.32 years, $SD = 5.77$), with roughly equal site representation (~130–155 per country). Mothers' education was predominantly secondary level (48%) and SES was mid-range. Prenatal PHQ-9 scores ranged 0–25 ($M = 6.80$, $SD = 4.70$): 36.1% reported minimal, 38.6% mild, 15.4% moderate, and 8.5% moderately severe or severe symptoms. Postnatal depression averaged $M = 4.82$ ($SD = 4.17$). PAI-R mean was $M = 52.72$ ($SD = 11.41$; range 18–72). At follow-up, 57.4% of mothers exclusively breastfed and 40.4% used formula or mixed feeding.

3.2.4.2 Correlations

Bivariate correlations were conducted between the key variable and the covariates, as given in Table 1.

Table 1
Correlations Between Study Variables

Variable	1	2	3	4	5	6	7	8	9	10
1. Prenatal depression	-									
2. Postnatal depression	.473**	-								
3. Maternal-fetal attachment	-.149**	-.041	-							
4. Mother's education	-.136**	-.097**	.310**	-						
5. Mother's age	-.059*	-.120**	-.029	-.007	-					
6. Socio-economic status	-.162**	-.123**	.165**	.393*	.123**	-				
7. Birth weight	-.046	-.119**	-.014	-.029	.134**	.109**	-			
8. Birth body length	-.072*	-.109**	.164**	.344**	.063*	.313**	-.002	-		
9. Birth head circumference	.107**	.149**	.056	-.033	.009	-.014	.009	-.024	-	

10.Breastfeeding exclusivity	-.103**	-.126**	.026	.043	.011	.072*	-.031	.041	-.093*	-
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Significant coefficients: * $p < .05$. ** $p < .01$.

3.2.4.3 Mediation Model

The tested mediation model (Figure 1) had good fit ($\chi^2(1) = 1.36$, $p = .234$, $TLI = 0.99$, $CFI = 1.00$, $RMSEA = 0.02$, $SRMR = 0.01$). Adding maternal education, age, and SES as covariates (Figure 2) preserved good fit ($CFI = 1.00$, $RMSEA = 0.03$), and a third model including child birth variables (Figure 3) also fitted well ($CFI = 1.00$, $RMSEA = 0.03$). Controlling for additional variables did not substantially change the relationships between the main study variables, and the initial model provided the best fit based on the Akaike Information Criterion (AIC).

Figure 1

Tested mediation model between key variables.

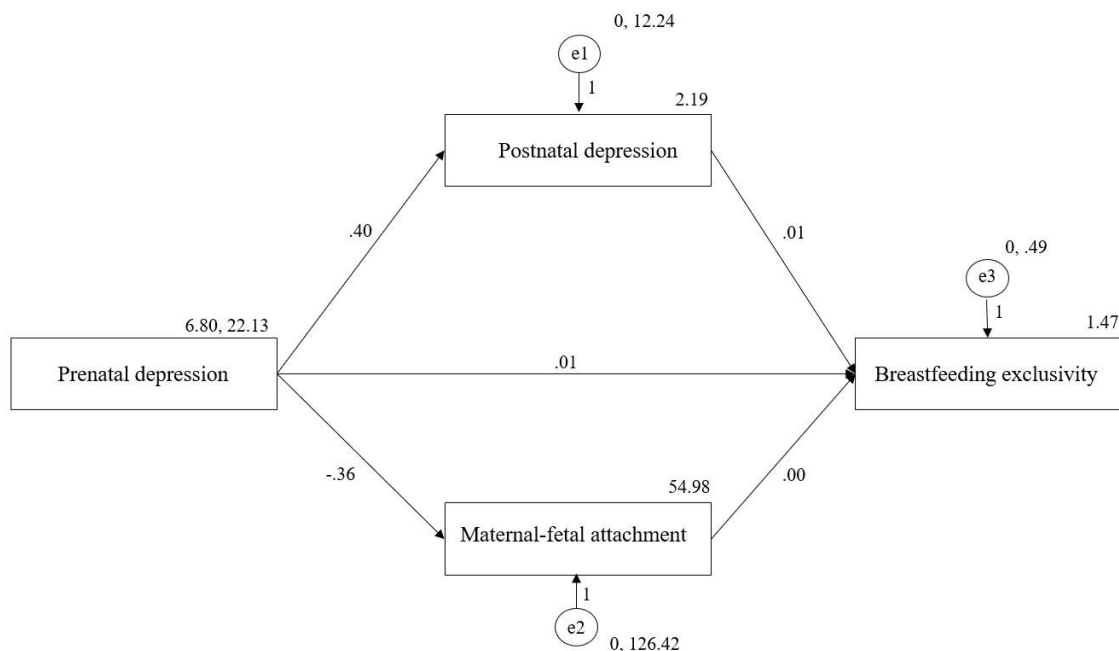
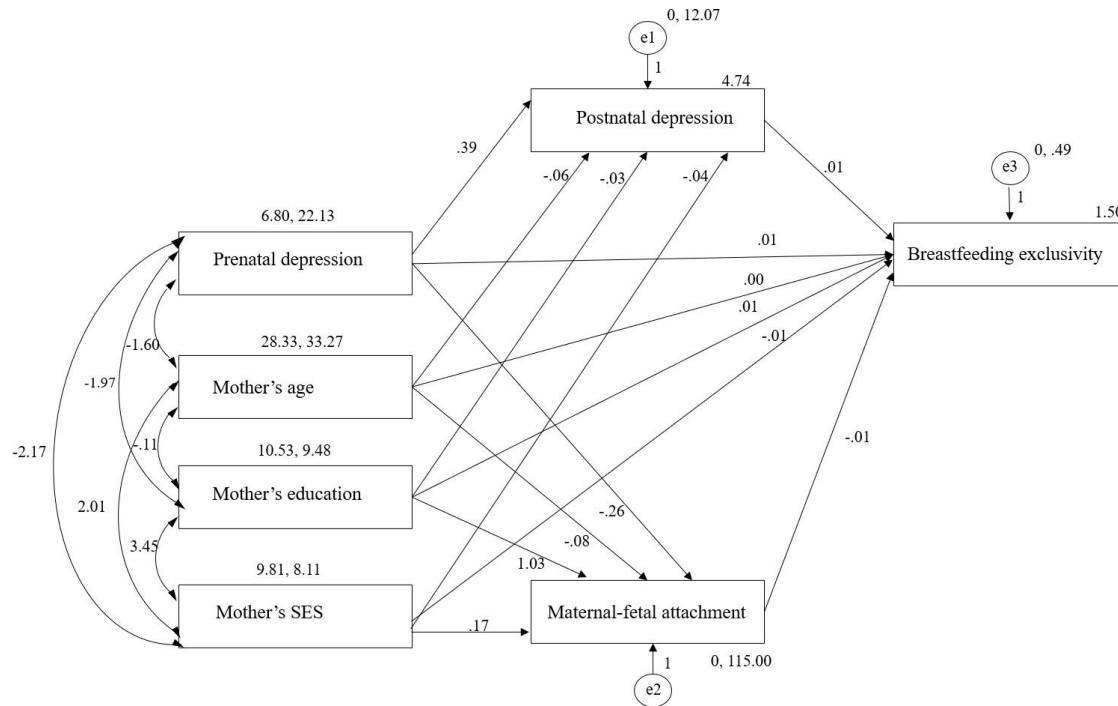


Figure 2

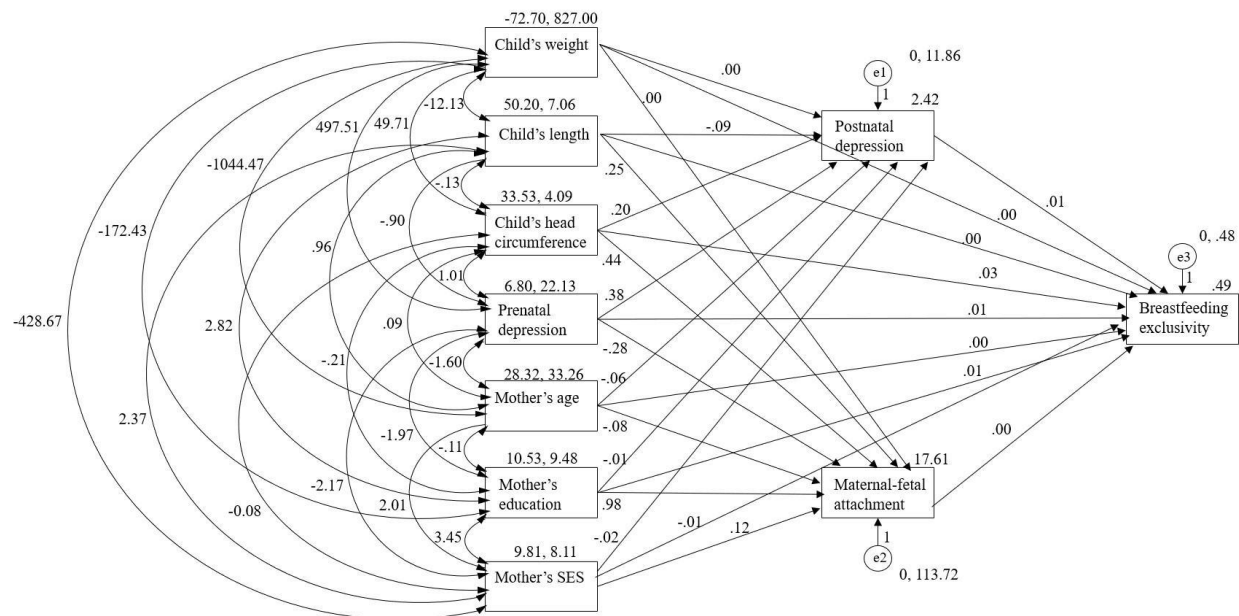
Mediation model including mother's age, education, and SES as covariates.



Note. SES, socioeconomic status

Figure 3

Mediation model including mother's age, education, SES and child's weight, body length, and head circumference at birth as covariates



Prenatal depression significantly predicted postnatal depression ($\beta = 0.399$, $p < .001$) and negatively predicted MFA ($\beta = -0.361$, $p < .001$), but did not directly predict breastfeeding exclusivity ($\beta = -0.054$, $p = .100$). Postnatal depression significantly predicted lower breastfeeding exclusivity ($\beta = -0.013$, $p = .002$), whereas MFA did not ($\beta = 0.001$, $p = .641$). The standardized indirect effect of prenatal depression on breastfeeding exclusivity via postnatal depression was significant ($\beta = -0.049$, $p = .005$, 95% CI $[-0.081, -0.017]$), indicating full mediation.

In the multigroup model (Table 2), the data provided good fit ($\chi^2(8) = 10.35$, $p = .241$, TLI = 0.95, CFI = 0.99, RMSEA = 0.02). Prenatal depression predicted postnatal depression across all eight sites and additionally predicted lower MFA in the Philippines, South Africa, and Sri Lanka. No direct effect of prenatal depression on breastfeeding exclusivity was identified in any site. Postnatal depression predicted breastfeeding exclusivity in Pakistan ($\beta = -0.249$, $p = .014$), whereas MFA predicted breastfeeding exclusivity only in Romania ($\beta = -0.281$, $p = .001$). A significant indirect effect via postnatal depression was found in Pakistan ($\beta = -0.145$, $p = .009$) and Sri Lanka ($\beta = -0.077$, $p = .035$).

Table 2
Unconstrained Multigroup Mediation Model with Parameters Free to Vary Across Countries

Country	a1 β	a2 β	b1 β	b2 β	Direct effect β	95% CI	Indirect effect β	95% CI
Ghana	0.522**	-0.157	-0.087	-0.009	-	-.303; .114 .075	-.044	-.151; .070
Jamaica	0.448**	-0.109	-0.012	0.011	.011	-.167; .189	-.006	-.088; .080
Pakistan	0.555**	0.081	-0.249*	-0.096	.060	-.135; .247	-.145*	-.269; -.039
Philippines	0.392**	-0.261**	0.067	-0.006	-	-.262; .085 .098	.028	-.051; .125
Romania	0.438**	-0.075	-0.079	-	.024	-.165; .215	-.013	-.103; .094
South Africa	0.402**	-0.245*	-0.056	0.044	.000	-.174; .173	-.032	-.131; .051

Sri Lanka	0.386**	-0.258*	-0.141	0.088	.108	-.067; .277	-.077*	-.192; -.005
Vietnam	0.237*	-0.074	-0.06	0.092	- .054	-.234; .108	-.021	-.081; .019

Note. Path a1 is the effect of prenatal depression on postnatal depression.

Path a2 is the effect of prenatal depression on postnatal maternal-fetal attachment.

Path b1 is the effect of postnatal depression on breastfeeding exclusivity.

Path b2 is the effect of maternal-fetal attachment on breastfeeding exclusivity. Significant coefficients: * $p < .05$. ** $p < .01$. CI, confidence interval

3.2.5 Discussion

This study showed that prenatal depression had a significant indirect effect on breastfeeding exclusivity, fully mediated by postnatal depression. Prenatal depressive symptoms predicted postnatal depressive symptoms, which in turn were negatively associated with breastfeeding exclusivity. This is consistent with previous studies linking postnatal depression with lower rates of exclusive breastfeeding (Kim et al., 2022; Sha et al., 2019). Possible mechanisms include the impact of depressive symptoms on mothers' breastfeeding self-efficacy, sensitivity to infant cues, and mother–child interaction quality (Mercan & Selcuk, 2021; Dennis & McQueen, 2007).

MFA did not mediate the prenatal depression–breastfeeding relationship in the full sample. However, prenatal depression predicted lower MFA in the Philippines, South Africa, and Sri Lanka, and MFA predicted lower breastfeeding exclusivity in Romania, consistent with the hypothesis that prenatal mental health affects the antenatal relationship with the infant (Rollè et al., 2020). The cross-site variation underscores the importance of sociocultural context: family and community support, cultural norms around breastfeeding, and local mental health services all shape how depression translates into feeding behavior (Gelaye et al., 2016; Tăut, 2017).

These findings call for early and longitudinal screening of depressive symptoms in LMICs where prevalence is high but resources are limited. Prenatal depressive symptoms may

also signal continued difficulties after birth that can negatively affect childcare practices and mother–child interaction. Breastfeeding support programs should be integrated with perinatal mental health care, recognizing that mothers experiencing depression may need additional assistance to meet breastfeeding goals. Future research should examine the bidirectional relationship between breastfeeding and postnatal depression and address measurement limitations associated with the PHQ-9 during pregnancy.

3.2.6 Limitations and Future Research

This study has several limitations. The use of convenience sampling limits the generalizability of the findings to more heterogeneous populations. In addition, maternal health problems or other factors that could interfere with milk supply were not assessed and may have influenced breastfeeding practices. The PHQ-9 is not specific to the prenatal period, and some items may overlap with somatic symptoms of pregnancy. Furthermore, postnatal depression and breastfeeding exclusivity were measured concurrently, preventing conclusions regarding the temporal direction of the relationship. Future research would benefit from clinician-administered diagnostic interviews and longitudinal designs that further clarify the relationship between postnatal depression and breastfeeding outcomes.

3.2.7 Conclusions

The present study suggests that prenatal depressive symptoms contribute to postnatal depressive symptoms, which in turn reduce the likelihood of exclusive breastfeeding. Although maternal–fetal attachment did not mediate this relationship in the overall sample, cross-site differences highlight the importance of sociocultural context in shaping maternal mental health and breastfeeding practices. These findings emphasize the importance of early identification and

support for depressive symptoms during the perinatal period, particularly in LMICs where prevalence rates are high and resources are limited.

3.3. Study 3: Changes in Maternal Depressive Symptoms and Mother–Child Relationship Quality at 24 Months

3.3.1 Introduction

3.3.1.1 The mother-child relationship as a developmental foundation

The relationship between mothers and their children in the first years of life is a foundational element in children’s development and long-term well-being (Frosch et al., 2019). The mother–child relationship begins to form prenatally through maternal–fetal attachment and represents an important context for socio-emotional development (Foley & Hughes, 2018; Trombetta et al., 2021). Previous research shows that maternal sensitivity and warmth are essential dimensions of a high-quality mother–child relationship and are associated with secure attachment and socio-emotional development (Madigan et al., 2024). The present study aims to move beyond observable interactional processes and attachment classifications by examining a further central dimension of the early mother–child relationship: the mother’s internal representation of her child. Accordingly, we focus on two dimensions of early relationship quality, capturing both mothers’ representations of the relationship and their understanding of the child’s feelings and intentions.

3.3.1.2 The representational dimension of the mother–child relationship

The mother’s internal working model is a core component of the attachment relationship (Bretherton & Munholland, 2008; Simkiss et al., 2013). Mothers form representations of the child and relationship based on caregiving interactions, perceptions of the child’s intentions and needs, and their own psychological state (Dollberg et al., 2010; Ishii & Tomoko, 2022). Perceiving the

child positively is associated with greater relational closeness (Goffin et al., 2018), whereas perceiving the child as intrusive or demanding may contribute to relational strain and less attuned caregiving (Kochanska & An, 2024). Mothers experiencing higher psychological distress may be more likely to perceive the infant as more invasive, with possible implications for the quality of early interactions and infant development (Bhopal et al., 2022).

3.3.1.3 The mind-mindedness dimension of the mother–child relationship

Mind-mindedness (MM) refers to parents' tendency to treat the child as a psychological agent with thoughts, emotions, desires, and intentions (Meins, 2013). MM links behavioral caregiving with parents' representations of the child (McMahon & Bernier, 2017) and can be assessed through interactional and representational tasks. Appropriate mind-related comments predict secure attachment (McMahon & Bernier, 2017; Zeegers et al., 2017), theory of mind (Laranjo et al., 2010), and fewer behavioral problems (Hughes et al., 2017, 2018). MM is relatively stable from infancy through toddlerhood (Illingworth et al., 2016). Psychological well-being and stress may influence parents' ability to remain oriented toward the child's inner states (Demers et al., 2010; Georg et al., 2023), although evidence regarding maternal depression and MM remains mixed (Georg et al., 2023; Firk, 2025).

3.3.1.4 Maternal depression

Maternal depression is one of the most common psychological difficulties during the perinatal period and may emerge prenatally, persist after birth, or develop later across early childhood (Al-Abri et al., 2023; Yu et al., 2020; Mora et al., 2009). Depressive symptoms may shape mothers' emotional and cognitive resources available for caregiving, thereby influencing representational relationship quality and MM. Meta-analytic evidence links maternal depression with poorer child outcomes (Goodman et al., 2011) and reduced parental mentalization (Georg et al., 2023). From a socio-ecological perspective (Bronfenbrenner, 1979), maternal mental health is

embedded within multiple contextual layers, ranging from individual psychological processes to relational, community, and broader socioeconomic conditions.

3.3.1.5 The Present Study

The present study focuses on mothers' internal representations of the relationship and of the child, drawing on longitudinal data from six LMICs. We examined how maternal depression in the perinatal and postnatal periods is associated with two constructs capturing mothers' representational evaluations of mother–child relationship quality at two years postpartum: (a) the Mother's Object Relations Scale–Short Form (MORS-SF) Warmth and Invasion dimensions, reflecting whether the child is perceived as more warm or more invasive, and (b) representational mind-mindedness (MM), reflecting the mother's tendency to view the child as an intentional agent. Maternal depression was treated as a process unfolding over time rather than an isolated episode. Prenatal depression was considered as the starting point, followed by changes in depressive symptoms from pregnancy to 6 months postpartum and from 6 months to 2 years postpartum. Regarding MM, evidence indicates that the links with maternal depressive symptoms are mixed across studies, some reporting null associations and others finding small to moderate negative associations (McMahon & Bernier, 2017; Corapci et al., 2024). Recent work suggests that observational MM may be more sensitive to detecting differences related to depressive symptoms than interview-based (representational) MM (Georg et al., 2023). Because MM data were available only in a subset of countries due to constraints in Wave 3 data collection during the COVID-19 pandemic, analyses involving MM were treated as exploratory.

3.3.2 Methods

3.3.2.1 Participants

The sample for Study 3 included mother–child dyads from six countries participating in all three waves: Ghana, Jamaica, the Philippines, Romania, Sri Lanka, and Vietnam. Only participants

with available data for the representational outcomes, predictors, and covariates relevant to the present analyses were retained. Primary analyses were conducted in the pooled multi-country sample, whereas country-specific and MM analyses were based on smaller subsamples. Accordingly, sample size varied across models depending on data availability.

3.3.2.2 Procedure and Measures

Data were drawn from the three-wave longitudinal design described in section 2.2.3 of the thesis. Maternal depressive symptoms were assessed during the third trimester of pregnancy (W1), at 3–6 months postpartum (W2), and at 24 months postpartum (W3) using the Patient Health Questionnaire-9 (PHQ-9). Representational outcomes were assessed at W3 using the Mother's Object Relations Scale–Short Form (MORS-SF) and the Three-Minute Speech Sample (TMSS) coding procedure for representational mind-mindedness in a subset of countries. Adjusted models additionally included maternal age, maternal education, subjective socioeconomic status, child sex, and community characteristics, including neighbourhood cohesion, neighbourhood closure, and neighbourhood disorder, as covariates.

3.3.3 Data analysis

All analyses were conducted using IBM SPSS Statistics (version 25), and confirmatory factor analyses (CFAs) were estimated using the lavaan package in R. The analytical plan included three stages: (a) measurement and longitudinal descriptive analyses, (b) hierarchical regression models predicting MORS Warmth and Invasion, and (c) exploratory MM analyses.

The PHQ-9 measurement structure was evaluated using one-factor CFAs across waves and countries. Because model fit varied across waves and sites, primary analyses used observed PHQ-9 total scores. Longitudinal change in depressive symptoms was indexed using observed difference scores: Δ_{12} (Wave 2 – Wave 1), Δ_{23} (Wave 3 – Wave 2), and Δ_{13} (Wave 3 – Wave 1). A

multigroup autoregressive SEM was additionally estimated to examine longitudinal stability in depressive symptoms across countries.

Hierarchical regression analyses predicting MORS Warmth and Invasion were estimated in three steps: baseline prenatal depressive symptoms at Step 1, depressive symptom change scores ($\Delta 12$ and $\Delta 23$) at Step 2, and sociodemographic and neighbourhood covariates at Step 3. Models were estimated first in the pooled sample and then separately by country, with country-level analyses treated as exploratory due to smaller sample sizes. The same hierarchical structure was applied to MM analyses, which were also treated as exploratory because MM data were available only in four countries.

Missing data were handled using complete-case (listwise) deletion. Accordingly, sample size varied across models depending on the availability of outcomes, predictors, and covariates.

3.3.4 Results

3.3.4.1 Descriptive Statistics

Participants' mean age was 28.65 years ($SD = 5.80$, range = 18–48). In the pooled sample, mean PHQ-9 scores declined from Wave 1 ($M = 6.58$, $SD = 4.55$) to Wave 2 ($M = 4.70$, $SD = 4.15$), followed by an increase at Wave 3 ($M = 5.71$, $SD = 4.85$). Mean MORS Warmth at Wave 3 was 18.31 ($SD = 2.72$), whereas mean MORS Invasion was 7.89 ($SD = 4.03$). Table 1 presents the PHQ-9 descriptive statistics by country and wave, whereas Figure 1 illustrates changes in depressive symptoms across waves.

Table 1
Descriptive Statistics for Maternal Depressive Symptoms (PHQ-9) Across Three Waves

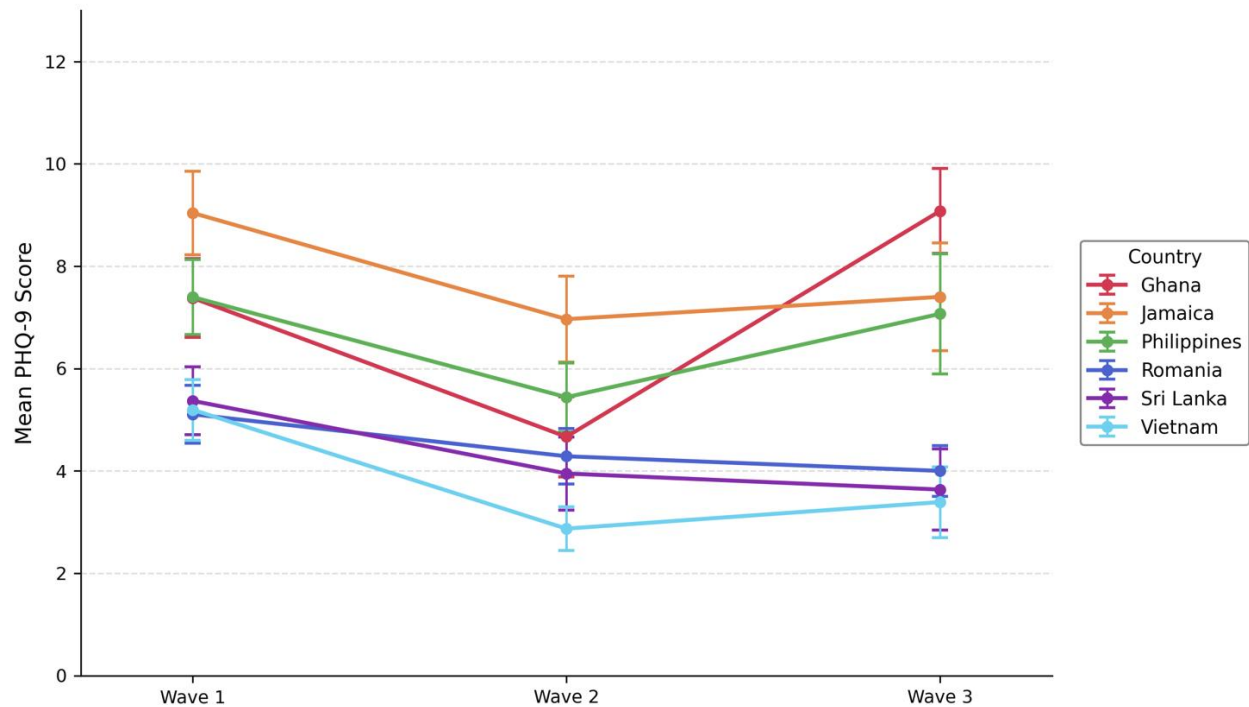
Country	N W1	W1 M(SD)	N W2	W2 M(SD)	N W3	W3 M(SD)
Ghana	145	7.38 (4.69)	111	4.67 (4.19)	116	9.08 (4.51)
Jamaica	152	9.04 (5.10)	143	6.97 (5.06)	115	7.40 (5.68)

Philippines	154	7.40 (4.58)	141	5.44 (4.04)	73	7.07 (5.02)
Romania	150	5.11 (3.49)	112	4.29 (2.91)	129	4.00 (2.86)
Sri Lanka	152	5.37 (4.15)	138	3.95 (4.25)	85	3.64 (3.67)
Vietnam	150	5.19 (3.68)	148	2.87 (2.62)	123	3.39 (3.87)

Note. Values are based on observed PHQ-9 total scores at each wave. Wave 1 = prenatal; Wave 2 = 3–6 months postpartum; Wave 3 = 18–24 months postpartum. Ns vary across waves due to attrition.

Figure 1

Mean PHQ-9 depressive symptom scores across three assessment waves by country.



Error bars represent 95% confidence intervals.

3.3.4.2 Within-Person Change in Depressive Symptoms

In the pooled sample, early change (Δ_{12}) was significantly negative (mean difference = -1.87 , $SD = 4.58$, $t(792) = -11.46$, $p < .001$, $dz = -0.41$), indicating a general decline in depressive symptoms from pregnancy to early postpartum. Late change (Δ_{23}) was significantly positive (mean difference = 1.18 , $SD = 4.84$, $t(640) = 6.17$, $p < .001$, $dz = 0.24$), indicating a partial rebound by 24 months. At the country level, all sites showed a significant decline from Wave 1 to Wave 2.

However, Ghana showed the clearest increase from Wave 2 to Wave 3 (mean difference = +4.76, $d_z = 0.87$), whereas Vietnam, Sri Lanka, and Romania showed sustained improvement or stability. Directional classification of $\Delta 13$ showed that 37.7% of participants decreased, 26.1% increased, and 6.6% remained stable over the full period.

3.3.4.3 Confirmatory Factor Analyses and Longitudinal Stability

One-factor confirmatory factor analyses (CFAs) of the PHQ-9 showed variable fit across countries and waves. Because model fit was inconsistent, subsequent analyses relied on observed PHQ-9 total scores rather than latent depression variables. Longitudinal analyses indicated moderate stability of depressive symptoms across waves.

3.3.4.4 Correlations Between Key Variables

Bivariate correlations among all study variables, together with means and standard deviations, are presented in Table 2.

Table 2
Means, Standard Deviations, and Intercorrelations Among Study 3 Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. PHQ-9 (W1)	6.58	4.55	—											
2. $\Delta 12$ (W1→W2)	-1.87	4.58	.58***	—										
3. $\Delta 23$ (W2→W3)	1.18	4.84	-.04	.34***	—									
4. MORS Warmth	18.31	2.72	-.07	.03	-.12**	—								
5. MORS Invasion	7.89	4.03	.18***	-.01	.18***	-.02	—							
6. Maternal age	28.65	5.80	-.05	-.07*	-.02	.04	.22***	—						
7. Maternal education	10.96	2.86	.14***	.05	.17***	.02	-.06	-.06	—					
8. SES	5.43	2.00	.20***	.04	-.12**	.09*	-.05	.06	.32***	—				
9. Neigh. cohesion	2.06	0.72	.29***	-.09**	.01	-.08*	.15***	.21***	-.02	.12***	—			
10. Neigh. closure	1.82	0.58	.12***	-.09*	.02	-.02	.01	-.04	.03	-.06	.49***	—		

11. Neigh. disorder	1.92	0.83	.20***	-.05	.13**	.02	.23***	.12***	-.03	-.09**	.24***	.08*	—	
12. Child sex	1.50	0.50	.05	-.01	-.05	-.11**	.10*	-.04	.04	.06	.02	-.04	.02	—

Note. Descriptive statistics are based on all available observations for each variable. Pairwise-complete observations were used for correlations. PHQ-9 (W1) = prenatal depressive symptom severity; $\Delta 12$ = Wave 2 - Wave 1; $\Delta 23$ = Wave 3 - Wave 2. Child sex coded 1 = female, 2 = male. * $p < .05$. ** $p < .01$. *** $p < .001$.

3.3.4.4 Hierarchical Regression Analyses

Pooled Models

Table 3 presents the pooled hierarchical regression model fit indices for MORS Warmth and MORS Invasion across the three steps. The adjusted pooled MORS analyses were conducted on samples ranging approximately between $N = 587$ and $N = 589$ depending on the outcome analysed. For Warmth, baseline depression was significant at Step 1 ($R^2 = .010$, adjusted $R^2 = .009$, $F(1, 587) = 6.21$, $p = .013$). Adding depressive symptom change scores at Step 2 significantly improved model fit ($\Delta R^2 = .025$, $\Delta F(2, 585) = 7.48$, $p = .001$), whereas the inclusion of covariates at Step 3 further improved the model ($\Delta R^2 = .032$, $\Delta F(7, 536) = 2.59$, $p = .012$), resulting in a final $R^2 = .065$ (adjusted $R^2 = .048$). In the final model for Warmth, higher baseline depression ($b = -0.098$, $\beta = -0.165$, $p = .006$), greater increases in depressive symptoms from Wave 1 to Wave 2 ($\Delta 12$; $b = -0.086$, $\beta = -0.144$, $p = .018$), and greater increases in depressive symptoms from Wave 2 to Wave 3 ($\Delta 23$; $b = -0.087$, $\beta = -0.159$, $p = .001$) predicted lower Warmth.

For Invasion, baseline depression was significant at Step 1 ($R^2 = .034$, adjusted $R^2 = .033$, $F(1, 587) = 20.79$, $p < .001$). Adding depressive symptom change scores at Step 2 substantially improved model fit ($\Delta R^2 = .098$, $\Delta F(2, 585) = 33.15$, $p < .001$), whereas covariates at Step 3 explained additional variance ($\Delta R^2 = .047$, $\Delta F(7, 536) = 4.37$, $p < .001$), resulting in a final $R^2 = .172$ (adjusted $R^2 = .156$). In the final model for Invasion, higher baseline depression ($b = 0.290$, β

= 0.324, $p < .001$), greater increases in depressive symptoms from Wave 1 to Wave 2 ($\Delta 12$; $b = 0.249$, $\beta = 0.276$, $p < .001$), and greater increases in depressive symptoms from Wave 2 to Wave 3 ($\Delta 23$; $b = 0.222$, $\beta = 0.268$, $p < .001$) predicted higher Invasion.

Among covariates, child sex ($b = -0.611$, $\beta = -0.115$, $p = .006$) and neighbourhood disorder ($b = 0.342$, $\beta = 0.104$, $p = .020$) were significant predictors of Warmth. For Invasion, maternal age ($b = -0.106$, $\beta = -0.146$, $p < .001$) and neighbourhood disorder ($b = 0.457$, $\beta = 0.092$, $p = .028$) were significant predictors.

Table 3
Pooled Hierarchical Regression Model Fit Indices for MORS Warmth and MORS Invasion

Outcome	Model	Step	N	R ²	Adj. R ²	F	p	ΔR^2	ΔF	Δp
MORS Warmth	Simple	1	589	.010	.009	6.21	.013	.010	6.21	.013
MORS Warmth	Simple	2	589	.035	.030	7.10	< .001	.025	7.48	.001
MORS Warmth	Adjusted	1	547	.010	.009	5.78	.017	.010	5.78	.017
MORS Warmth	Adjusted	2	547	.033	.028	6.25	< .001	.023	6.42	.002
MORS Warmth	Adjusted	3	547	.065	.048	3.72	< .001	.032	2.59	.012
MORS Invasion	Simple	1	589	.034	.033	20.79	< .001	.034	20.79	< .001
MORS Invasion	Simple	2	589	.133	.128	29.79	< .001	.098	33.15	< .001
MORS Invasion	Adjusted	1	547	.036	.034	20.20	< .001	.036	20.20	< .001
MORS Invasion	Adjusted	2	547	.125	.120	25.78	< .001	.089	27.58	< .001
MORS Invasion	Adjusted	3	547	.172	.156	11.13	< .001	.047	4.37	< .001

Note. Step 1 = baseline depression severity at Wave 1; Step 2 = Step 1 + change scores ($\Delta 12$, $\Delta 23$); Step 3 = Step 2 + covariates. Values are based on listwise deletion.

Country-Specific Models

Country-specific adjusted models showed variability in the strength and significance of associations across sites. Country-specific analyses were conducted on smaller subsamples,

generally ranging between approximately $n = 73$ and $n = 123$ at Wave 3, depending on data availability. For Warmth, significant final adjusted models were observed in Ghana ($R^2 = .278$, adjusted $R^2 = .184$, $F(10, 77) = 2.96$, $p = .003$), Romania ($R^2 = .210$, adjusted $R^2 = .125$, $F(10, 93) = 2.47$, $p = .012$), and Vietnam ($R^2 = .226$, adjusted $R^2 = .137$, $F(10, 87) = 2.54$, $p = .010$). In Ghana, higher maternal education predicted higher Warmth ($b = 0.806$, $\beta = 0.357$, $p = .002$). In Romania, child sex was the only significant predictor, with lower Warmth scores observed for male children ($b = -1.724$, $\beta = -0.373$, $p < .001$). In Vietnam, higher baseline depression ($b = -0.285$, $\beta = -0.364$, $p = .029$) and greater increases in depressive symptoms from Wave 2 to Wave 3 ($b = -0.282$, $\beta = -0.400$, $p = .001$) predicted lower Warmth.

For Invasion, significant final adjusted models were observed in Ghana ($R^2 = .247$, adjusted $R^2 = .133$, $F(10, 66) = 2.17$, $p = .031$), the Philippines ($R^2 = .395$, adjusted $R^2 = .298$, $F(10, 62) = 4.06$, $p < .001$), Romania ($R^2 = .217$, adjusted $R^2 = .133$, $F(10, 94) = 2.59$, $p = .009$), and Vietnam ($R^2 = .314$, adjusted $R^2 = .235$, $F(10, 87) = 3.99$, $p < .001$). The addition of covariates significantly improved model fit only in the Philippines ($\Delta R^2 = .323$, $\Delta F(7, 62) = 4.80$, $p < .001$), suggesting that sociodemographic and neighbourhood factors made an important additional contribution to explaining perceived Invasion in this site.

3.3.4.5 Mind-Mindedness (Exploratory Analyses)

Mind-mindedness analyses were treated as exploratory because MM data were available only in four sites (Philippines, Romania, Sri Lanka, and Vietnam). The pooled MM analyses were conducted on smaller samples ranging approximately between $N = 384$ and $N = 390$, while country-specific MM analyses ranged approximately between $n = 73$ and $n = 123$. Mean MM scores varied across countries, with the lowest average observed in the Philippines ($M = 0.257$, $SD = 0.149$) and the highest in Sri Lanka ($M = 0.515$, $SD = 0.184$).

In the pooled adjusted model, baseline depressive severity was not significant at Step 1 ($R^2 = .005$, adjusted $R^2 = .002$, $F(1, 349) = 1.80$, $p = .180$). Adding $\Delta 12$ and $\Delta 23$ at Step 2 significantly improved model fit ($\Delta R^2 = .037$, $\Delta F(2, 347) = 6.74$, $p = .001$), whereas the inclusion of sociodemographic and neighbourhood covariates at Step 3 further improved the model ($\Delta R^2 = .051$, $\Delta F(7, 340) = 2.76$, $p = .009$). The final adjusted model was significant overall ($R^2 = .094$, adjusted $R^2 = .067$, $F(10, 340) = 3.52$, $p < .001$).

In the final model, higher baseline depressive severity ($b = -0.009$, $\beta = -0.180$, $p = .017$) and greater increases in depressive symptoms from Wave 1 to Wave 2 ($\Delta 12$; $b = -0.010$, $\beta = -0.222$, $p = .007$) were associated with lower MM, whereas $\Delta 23$ was marginal ($p = .053$). Among covariates, neighbourhood cohesion predicted lower MM ($b = -0.064$, $\beta = -0.193$, $p = .006$), whereas neighbourhood closure predicted higher MM ($b = 0.086$, $\beta = 0.253$, $p < .001$).

Country-specific adjusted MM models were significant in the Philippines ($R^2 = .288$, adjusted $R^2 = .174$, $F(10, 62) = 2.51$, $p = .013$), Sri Lanka ($R^2 = .280$, adjusted $R^2 = .173$, $F(10, 67) = 2.61$, $p = .010$), and Vietnam ($R^2 = .192$, adjusted $R^2 = .098$, $F(10, 86) = 2.04$, $p = .038$), whereas the Romanian model was not significant. In all three significant models, the addition of covariates at Step 3 significantly improved model fit.

3.3.5 Discussion

The present study examined whether maternal depressive symptoms, both in the prenatal period and changes across the postnatal period, were associated with mothers' representations of the child and of the mother-child relationship at 24 months postpartum. Overall, the findings support a developmental perspective on maternal depression, suggesting that its relevance lies not only in initial symptom severity, but also in how symptoms evolve across early motherhood. In the pooled sample, symptoms declined from pregnancy to early postpartum and then showed a

partial rebound by toddlerhood, indicating that maternal distress fluctuates across developmental stages rather than following a simple linear course.

Regarding representational dimensions of the relationship, higher prenatal depressive symptoms and greater increases in depressive symptoms across both intervals were associated with lower Warmth and higher Invasion, with the pattern being stronger and more consistent for Invasion. This may suggest that depressive symptoms are reflected more clearly in strained or burdened maternal representations of the child and relationship. Importantly, the change scores added explanatory value beyond prenatal depressive symptoms alone, supporting the view that it is not only early vulnerability that matters, but also how symptoms change across early motherhood.

The pooled adjusted models further showed that these associations remained significant after accounting for sociodemographic and neighbourhood factors. At the same time, neighbourhood disorder was associated with both Warmth and Invasion, although in different directions, suggesting that community influences on maternal representations may be more complex than a simple risk pattern. Country-level analyses also showed both cross-national regularities and meaningful contextual variation. Associations with Invasion were more consistent across countries than those observed for Warmth, suggesting that more strained maternal representations may be more robustly linked to depressive symptoms across sociocultural settings.

The findings for MM should be interpreted cautiously, as analyses were exploratory and based on a reduced subsample of four countries. In pooled analyses, higher baseline depressive severity and greater symptom increases from pregnancy to early postpartum were associated with lower MM, although the findings were less consistent than those observed for MORS dimensions. This may suggest that MM reflects a somewhat different aspect of maternal representation, one

that is less directly linked to depressive symptoms alone and more dependent on wider individual and contextual conditions.

3.3.6 Limitations and Future Research

Confirmatory factor analyses indicated suboptimal fit for the PHQ-9 in several sites, suggesting some caution in direct cross-country comparisons of depressive symptom scores. At the same time, the PHQ-9 showed acceptable internal consistency and remains one of the most widely used measures of depressive symptoms in cross-cultural research.

Although attrition is expected in longitudinal research conducted over extended follow-up periods, reduced sample sizes may have limited statistical power, particularly for country-level analyses.

In addition, the study is observational and does not permit causal inferences. Although maternal depressive symptoms were examined longitudinally, bidirectional processes and unmeasured contextual factors may also contribute to the observed associations.

The MM findings should also be interpreted cautiously, as MM data were available only in four countries and only representational MM was assessed. Finally, although the multi-country design is a major strength of the study, the constructs examined may not carry identical meanings across cultural settings. Future research should continue to investigate the cross-cultural comparability of these constructs and further examine contextual factors that may shape depressive symptoms and maternal representations.

3.3.7 Conclusions

Overall, the findings of the present study suggest that maternal depressive symptoms were relevant for mothers' representations of the child and of the mother-child relationship at 24 months, both through prenatal symptom levels and through changes in symptoms across early motherhood. Increases in depressive symptoms during the postnatal period were associated with

lower Warmth and higher Invasion, supporting the importance of a longitudinal perspective on maternal depression. The pattern of associations was more consistent for Invasion than for Warmth, suggesting that more strained maternal representations may be more closely linked to depressive symptoms across different sociocultural contexts. The MM analyses were less consistent and should be interpreted with caution, given their exploratory nature and the availability of data in only four countries. Overall, the study supports a socio-ecological understanding of maternal mental health, in which depressive symptoms, maternal representations, and the relational and community context intersect in shaping the early mother–child relationship.

3.4. Study 4: Changes in Maternal Depressive Symptoms and Children's Socio-Emotional Development at 24 Months

3.4.1 Introduction

3.4.1.1 Early Socio-Emotional Development in the First Two Years of Life

The first two years of life are a critical period for children's development across all domains. This study focuses on socio-emotional development, conceptualized as a multidimensional construct that includes both positive competencies (e.g., emotional responsiveness, self-regulation, social engagement) and vulnerabilities (e.g., emotional distress, dysregulation, behavioral problems; Halle & Darling-Churchill, 2016; Rothbart & Bates, 2006). Early socio-emotional development emerges through interactions with caregivers and the broader environment (Posner & Rothbart, 2000; Spinrad et al., 2006; Skinner & Zimmer-Gembeck, 2007). Evidence indicates that early socio-emotional functioning has lasting implications for later relational, academic, and health outcomes (Romano et al., 2010; Moffitt et al., 2011; McClelland & Cameron, 2019).

3.4.1.2 Maternal Depression During the Perinatal and Early Parenting Period

Maternal mental health during the perinatal and early parenting years is an important factor shaping children's development (Muzik & Borovska, 2010; Lowthian et al., 2023). Maternal depression is among the most prevalent and persistent mental health difficulties during this period (Dagher et al., 2021). Depressive symptoms can emerge during pregnancy, fluctuate across the postpartum period, and persist into toddlerhood, each phase potentially affecting the mother–child dyad in different ways (Guyon-Harris et al., 2016; Suarez et al., 2023).

3.4.1.3 Maternal Depression and Children's Socio-Emotional Development

Evidence indicates that maternal depression is associated with poorer socio-emotional development in children, both concurrently and longitudinally. Maternal depressive symptoms have been linked to lower socio-emotional competencies, as well as higher levels of emotional and behavioral difficulties (Burger et al., 2020; Honda et al., 2023; Phua et al., 2023). Longitudinal findings further suggest that persistent maternal depressive symptoms are associated with higher levels of children's internalizing and externalizing problems. In contrast, decreasing symptoms are linked to lower levels of these difficulties (Morales et al., 2023). Consistent with these findings, Study 1 of this thesis showed that maternal depression was associated with both socio-emotional competencies and socio-emotional problems. However, associations were stronger for problem-focused outcomes.

3.4.1.4 The Present Study

Despite the importance of longitudinal perspectives, studies examining maternal depressive symptoms across multiple developmental phases and their associations with children's

socio-emotional development remain limited, particularly in LMICs (Morgan et al., 2021; Frost et al., 2025). The present study investigates how changes in maternal depressive symptoms across three time points (prenatal, 3–6 months postpartum, and 18–24 months postpartum) relate to children’s socio-emotional development at 24 months in six LMIC sites (Ghana, Jamaica, the Philippines, Romania, Sri Lanka, and Vietnam).

Children’s socio-emotional development is conceptualized as multidimensional, including prosocial behavior, internalizing problems, aggression, ADHD-related behaviors, and a total socio-emotional problems composite. Guided by the socio-ecological model (Sallis & Owen, 2015), the study also examines whether sociodemographic and community-level factors contribute to variability in the relationship between maternal depressive symptoms and children’s socio-emotional development.

4.4.2 Methods

3.4.2.1 Participants and Procedure

Study 4 used data from the three-wave longitudinal cohort described in Section 2.2.3 of the thesis, including mother–child dyads from Ghana, Jamaica, the Philippines, Romania, Sri Lanka, and Vietnam. Pakistan and South Africa did not participate in Wave 3 and were excluded from the present analyses.

Maternal depressive symptoms were assessed during pregnancy (W1), at 3–6 months postpartum (W2), and at 18–24 months postpartum (W3). Children’s socio-emotional development was assessed at W3. Adjusted models additionally included sociodemographic and community-level covariates, including maternal age, maternal education, socioeconomic status, child sex, neighbourhood cohesion, neighbourhood closure, and neighbourhood disorder. Sample sizes differed across analyses depending on data availability.

3.4.2.2 Measures

Maternal depressive symptoms were assessed using the PHQ-9 (Kroenke et al., 2001) at all three waves. Two within-person change scores were computed: early change (Δ_{12} = Wave 2 – Wave 1) and late change (Δ_{23} = Wave 3 – Wave 2). Children's socio-emotional development at 24 months was assessed using the Social Behaviour Questionnaire (SBQ), a mother-report measure capturing Prosocial behavior, Internalizing problems, Aggression, and ADHD-related behaviors; a composite Socio-Emotional Problems score was calculated as the sum of the three problem subscales. The adjusted models included maternal age, maternal education, socioeconomic status (SES), child sex, neighbourhood cohesion, neighbourhood closure, and neighbourhood disorder as covariates.

3.4.3 Data Analysis

Hierarchical regression analyses were conducted to examine whether maternal depressive symptoms across time were associated with children's socio-emotional outcomes at Wave 3. Baseline PHQ-9 severity at Wave 1 and two depression change scores (Δ_{12} and Δ_{23}) were included as predictors.

The outcomes examined were SBQ Prosocial, SBQ Internalising, SBQ Aggression, SBQ ADHD, and a socio-emotional problems composite score. Simple models included baseline depressive symptoms at Step 1 and the two change scores at Step 2, whereas adjusted models additionally included sociodemographic and community-level covariates at Step 3. All models were estimated in the pooled sample and separately by country. Model fit was evaluated using R^2 , adjusted R^2 , F , and change statistics.

3.4.4 Results

3.4.4.1 Descriptive Statistics

Marked cross-national variation was observed across all socio-emotional outcomes. Prosocial scores were highest in Jamaica ($M = 7.37$, $SD = 2.46$) and lowest in Vietnam ($M = 5.00$, $SD = 2.41$). Internalising scores were highest in the Philippines ($M = 3.45$, $SD = 2.06$) and lowest in Romania ($M = 1.78$, $SD = 1.42$). Aggression scores were highest in Jamaica ($M = 5.18$, $SD = 2.43$), whereas ADHD scores were highest in the Philippines ($M = 6.58$, $SD = 3.21$). The socio-emotional problems composite score was highest in the Philippines ($M = 14.81$, $SD = 6.05$) and lowest in Romania ($M = 8.16$, $SD = 4.46$).

3.4.4.2 Correlations

Bivariate correlations showed that maternal depressive symptoms at Wave 1 were positively associated with Internalising ($r = .132$, $p < .001$), Aggression ($r = .247$, $p < .001$), ADHD ($r = .112$, $p = .002$), and the socio-emotional problems composite ($r = .201$, $p < .001$), whereas associations with Prosocial behavior were not significant. Greater increases in depressive symptoms from Wave 2 to Wave 3 ($\Delta 23$) were also positively associated with Internalising ($r = .327$, $p < .001$), Aggression ($r = .209$, $p < .001$), ADHD ($r = .159$, $p < .001$), and socio-emotional problems ($r = .276$, $p < .001$). Overall, depressive symptoms showed more consistent associations with socio-emotional difficulties than with prosocial behavior.

3.4.4.3 Hierarchical Regression Analyses

Pooled Models

Only the adjusted pooled models are summarized below. The pooled adjusted analyses were conducted on samples ranging approximately between $N = 545$ and $N = 547$ depending on the outcome analysed.

Depressive symptoms were more consistently associated with socio-emotional difficulties than with Prosocial behavior. For **Prosocial**, the adjusted model was significant overall ($R^2 = .049$,

adjusted $R^2 = .031$, $F(10, 534) = 2.74$, $p = .003$), but none of the depression variables remained significant after covariate adjustment. Instead, higher SES ($b = .124$, $\beta = .097$, $p = .036$) and higher neighbourhood cohesion ($b = .574$, $\beta = .165$, $p = .002$) were associated with higher Prosocial scores.

For **Internalising**, the adjusted model was significant ($R^2 = .170$, adjusted $R^2 = .155$, $F(10, 536) = 10.99$, $p < .001$). Baseline depressive severity ($b = .120$, $\beta = .277$, $p < .001$), $\Delta 12$ ($b = .109$, $\beta = .250$, $p < .001$), and $\Delta 23$ ($b = .155$, $\beta = .388$, $p < .001$) were all significant positive predictors, whereas none of the covariates reached significance.

For **Aggression**, the adjusted model was significant ($R^2 = .216$, adjusted $R^2 = .201$, $F(10, 536) = 14.75$, $p < .001$). Baseline depressive severity ($b = .168$, $\beta = .325$, $p < .001$), $\Delta 12$ ($b = .073$, $\beta = .140$, $p = .012$), and $\Delta 23$ ($b = .127$, $\beta = .264$, $p < .001$) remained significant positive predictors. Older maternal age ($b = -.054$, $\beta = -.129$, $p = .001$) and higher neighbourhood closure ($b = -.649$, $\beta = -.159$, $p < .001$) were associated with lower Aggression, whereas higher neighbourhood cohesion ($b = .366$, $\beta = .114$, $p = .020$) and higher neighbourhood disorder ($b = .352$, $\beta = .122$, $p = .003$) were associated with higher Aggression.

For **ADHD**, the adjusted model was significant ($R^2 = .124$, adjusted $R^2 = .108$, $F(10, 536) = 7.59$, $p < .001$). Baseline depressive severity ($b = .178$, $\beta = .277$, $p < .001$), $\Delta 12$ ($b = .153$, $\beta = .236$, $p < .001$), and $\Delta 23$ ($b = .143$, $\beta = .239$, $p < .001$) were all significant positive predictors. Male child sex ($b = .574$, $\beta = .100$, $p = .015$) and lower SES ($b = -.142$, $\beta = -.097$, $p = .029$) were also associated with higher ADHD scores.

For the **socio-emotional problems composite**, the adjusted model was significant ($R^2 = .228$, adjusted $R^2 = .214$, $F(10, 536) = 15.83$, $p < .001$). Baseline depressive severity ($b = .466$, $\beta = .368$, $p < .001$), $\Delta 12$ ($b = .335$, $\beta = .262$, $p < .001$), and $\Delta 23$ ($b = .425$, $\beta = .361$, $p < .001$)

remained significant positive predictors. Older maternal age ($b = -.095$, $\beta = -.092$, $p = .021$) and higher neighbourhood closure ($b = -1.006$, $\beta = -.101$, $p = .024$) were associated with fewer socio-emotional problems, whereas higher neighbourhood disorder ($b = .666$, $\beta = .095$, $p = .019$) was associated with more problems.

Country-Specific Models

Country-specific adjusted models showed a more variable pattern across outcomes and countries. Country-specific adjusted analyses were estimated on smaller subsamples, ranging approximately between $n = 77$ and $n = 115$ depending on the country and outcome analysed. For Prosocial, only Romania showed a significant final adjusted model ($R^2 = .206$, adjusted $R^2 = .120$, $F(10, 92) = 2.39$, $p = .014$). In this model, older maternal age and male child sex were associated with lower Prosocial scores, suggesting that prosocial behaviour may have been more closely linked to demographic and contextual factors than to maternal depressive symptoms.

For Internalising, significant adjusted models were observed in Ghana ($R^2 = .354$, adjusted $R^2 = .256$, $p = .001$), Jamaica ($R^2 = .227$, adjusted $R^2 = .153$, $p = .002$), the Philippines ($R^2 = .318$, adjusted $R^2 = .207$, $p = .005$), and Vietnam ($R^2 = .290$, adjusted $R^2 = .208$, $p = .001$), whereas Romania and Sri Lanka were non-significant. Importantly, the covariate block did not significantly improve model fit in any country, suggesting that the association between maternal depressive symptoms and internalising problems remained relatively robust after adjustment.

For Aggression, significant adjusted models were found in Ghana ($R^2 = .294$, adjusted $R^2 = .187$, $p = .007$), the Philippines ($R^2 = .355$, adjusted $R^2 = .250$, $p = .001$), and Vietnam ($R^2 = .344$, adjusted $R^2 = .269$, $p < .001$). In Ghana, lower neighbourhood cohesion and higher neighbourhood disorder were associated with higher Aggression scores, suggesting that community conditions may have been particularly relevant for aggressive behaviours in this context. In the Philippines

and Vietnam, maternal depressive symptoms remained the primary significant predictors, whereas the covariates were not significant.

For ADHD, significant adjusted models were observed in Ghana ($R^2 = .318$, adjusted $R^2 = .215$, $p = .003$), the Philippines ($R^2 = .300$, adjusted $R^2 = .187$, $p = .009$), Romania ($R^2 = .217$, adjusted $R^2 = .134$, $p = .008$), and Vietnam ($R^2 = .193$, adjusted $R^2 = .101$, $p = .034$). Across these countries, maternal depressive symptoms generally remained significant predictors after adjustment, whereas the covariates were mostly non-significant.

The most consistent pattern across countries was observed for Total Socio-emotional Problems. Significant adjusted models were identified in Ghana ($R^2 = .404$, adjusted $R^2 = .314$, $p < .001$), Jamaica ($R^2 = .174$, adjusted $R^2 = .095$, $p = .023$), the Philippines ($R^2 = .406$, adjusted $R^2 = .310$, $p < .001$), Romania ($R^2 = .218$, adjusted $R^2 = .135$, $p = .007$), and Vietnam ($R^2 = .336$, adjusted $R^2 = .260$, $p < .001$), whereas Sri Lanka was non-significant. Some country-specific covariates were also relevant. In Ghana, lower neighbourhood cohesion and higher neighbourhood disorder were associated with more socio-emotional problems. In the Philippines, lower maternal education was associated with more total problems, whereas in Vietnam higher SES was associated with fewer socio-emotional problems.

3.4.5 Discussion

The present study examined whether changes in maternal depressive symptoms across three waves were associated with children's socio-emotional development at 24 months across six LMIC sites. Overall, maternal depressive symptoms were more consistently associated with children's socio-emotional and behavioural difficulties than with positive socio-emotional competencies. In the pooled analyses, higher prenatal depressive severity and increases in depressive symptoms across both postnatal intervals were associated with higher levels of

Internalising, Aggression, ADHD symptoms, and total socio-emotional problems, whereas the findings for Prosocial behaviour were weaker and less consistent. These findings are broadly consistent with Study 1 of this thesis, suggesting that the asymmetry between problem-focused and competence-focused outcomes may also be observed longitudinally across diverse sociocultural contexts.

An important finding was that the change scores explained additional variance beyond prenatal depressive severity alone, particularly for Internalising problems and the socio-emotional problems composite. This suggests that children may be sensitive not only to prenatal exposure, but also to the persistence or increase of maternal depressive symptoms across infancy and toddlerhood. The findings support the idea that maternal depressive symptoms should not be conceptualized only as a prenatal or early postpartum risk factor, but rather as a dynamic process unfolding across the first years of the child's life. From a clinical perspective, this reinforces the importance of monitoring maternal mental health beyond the immediate postpartum period.

The findings for Prosocial behaviour differed from the patterns observed for socio-emotional difficulties. In the adjusted pooled model, depressive symptoms were no longer significant after accounting for contextual variables, whereas higher SES and neighbourhood cohesion were associated with higher Prosocial scores. This pattern may suggest that positive socio-emotional competencies are shaped more strongly by contextual and environmental resources than by maternal depressive symptoms alone.

The country-specific analyses further highlighted the importance of context. Although significant associations between maternal depressive symptoms and socio-emotional difficulties were observed across multiple countries, the magnitude and consistency of these effects varied across sites. The strongest and most consistent models were generally observed for total socio-

emotional problems, particularly in Ghana, the Philippines, and Vietnam. In some countries, neighbourhood-level variables also appeared relevant. For example, lower neighbourhood cohesion and higher neighbourhood disorder were associated with higher Aggression and more socio-emotional problems in Ghana.

Overall, the findings suggest a pattern of partial cross-national consistency alongside meaningful contextual variation. Some associations between maternal depressive symptoms and children's socio-emotional difficulties appeared relatively stable across countries, particularly for Internalising and total socio-emotional problems, whereas other outcomes appeared more context-sensitive. These differences may suggest that the links between maternal depressive symptoms and children's socio-emotional outcomes are shaped, at least in part, by the wider sociocultural context in which children develop. Countries may differ in the ways family and community networks are involved in caregiving, as well as in norms regarding autonomy, interdependence, and children's behaviour. Such differences may also influence how children's socio-emotional difficulties are interpreted and reported by mothers. The study therefore, extends previous research by showing that changes in maternal depressive symptoms across time may represent an important longitudinal risk process across diverse LMIC contexts, while also highlighting the role of broader socio-ecological conditions in shaping these associations.

3.4.6 Limitations and Future Research

Several limitations should be considered. Some methodological limitations related to attrition, measurement, and cross-cultural comparability were discussed in the previous studies and remain relevant here. In addition, some country-specific analyses were based on smaller subsamples and should therefore be interpreted cautiously.

The study also relied primarily on maternal self-report measures, which may have increased shared-method variance between maternal depressive symptoms and children's socio-emotional outcomes. Finally, the observational design does not allow causal conclusions, and bidirectional associations between maternal depressive symptoms and children's socio-emotional difficulties are also possible. Future research would benefit from incorporating observational and multi-informant measures, as well as from examining additional contextual and family-level factors across diverse sociocultural settings.

3.4.7 Conclusions

The present study provides longitudinal evidence that maternal depressive symptoms were associated with children's socio-emotional development at 24 months across six diverse LMIC sites. These associations were observed both for prenatal depressive severity and for changes in depressive symptoms across early motherhood, with effects appearing more consistently for socio-emotional and behavioural difficulties than for Prosocial behaviour. The additional contribution of the change scores further suggests that it is important to consider not only early depressive symptoms, but also how maternal distress evolves across the transition to motherhood and the first years of the child's life.

Although many associations remained significant after accounting for socio-demographic and neighbourhood factors, meaningful variation across outcomes and countries was also observed. This pattern suggests partial cross-national consistency alongside contextual variation, highlighting the importance of considering the broader sociocultural context in which children develop. Overall, the findings support the importance of longitudinal and socio-ecological approaches when examining maternal mental health and children's socio-emotional development

across diverse LMIC settings. The results also underline the importance of monitoring and supporting maternal mental health beyond the immediate postpartum period.

CHAPTER IV. GENERAL DISCUSSIONS AND CONCLUSIONS

4.1 Summary of Contributions Beyond the State of the Art

The general objective of the present thesis was to examine, within a socio-ecological framework, how maternal depressive symptoms from pregnancy to early childhood are associated with maternal caregiving behaviour, mother–child relationship quality, and children's socio-emotional development, as well as the individual, relational, and community factors that may shape these associations. Across the four studies addressing this objective, the findings point to a common central idea: maternal depressive symptoms may become relevant for early development through multiple, partly distinct processes across early motherhood, rather than through a single pathway. In this sense, the thesis supports the view that early motherhood should be understood not only as a period of rapid development for children, but also as a period in which maternal psychological functioning may show both continuity and change, with implications for caregiving, relational, and developmental processes.

The thesis extends the current state of knowledge in three main ways. First, rather than examining maternal depressive symptoms only at a single time point, it approached them as a process unfolding across early motherhood, by modelling both prenatal symptom severity and subsequent changes across three time points. The findings showed that these changes explained variance in relational and developmental outcomes beyond what baseline prenatal symptoms alone could account for, supporting the view that what matters is not only early vulnerability, but also how symptoms evolve from pregnancy to 24 months postpartum. Second, the thesis adds to

previous literature showing that maternal depressive symptoms were more consistently linked to socio-emotional difficulties than to positive competencies; this pattern was reflected longitudinally across the studies and across diverse LMIC settings, while positive competencies such as prosocial behaviour appeared more closely tied to contextual resources than to maternal distress. Third, by drawing on a multi-country LMIC sample, the thesis showed that associations between perinatal depression and caregiving, relational, and developmental outcomes are observable across diverse cultural, economic, and community conditions, but that their pattern is not identical across sociocultural contexts, further supporting the need to understand these processes within a socio-ecological framework.

4.1.1 Theoretical Contributions

The present thesis contributes to the existing literature by offering a more differentiated and empirically grounded understanding of how maternal depressive symptoms become relevant for early development. A central feature of this contribution concerns the sociocultural scope of the evidence on perinatal depression. Much of the current evidence has been generated in WEIRD populations, with limited longitudinal evidence from low- and middle-income countries (Henrich et al., 2010; Morgan et al., 2021). By adopting a multi-country longitudinal design across LMIC settings, the thesis extends existing knowledge to more diverse contexts and provides evidence on how these processes unfold across different sociocultural settings.

A first contribution of the thesis concerns the temporal dimension of maternal depressive symptoms in early motherhood. By capturing depressive symptoms as within-person changes across three intervals, the thesis contributes to the understanding that how symptoms evolve carries independent relevance for caregiving, relational, and developmental outcomes, beyond what prenatal severity alone can explain. The longitudinal analyses (Study 3) further suggest that

depressive symptoms are characterized by both continuity and change across early motherhood, indicating that both baseline severity and subsequent change carry distinct information about how maternal distress unfolds. This pattern, observed across outcome domains within this multi-country design, supports a dynamic understanding of perinatal depression that attends to the direction and magnitude of change rather than to symptom level at a single time point (Guyon-Harris et al., 2016; Morales et al., 2023).

The meta-analytic component of the thesis (Study 1) provides an up-to-date synthesis of the association between maternal depression and children's socio-emotional development in the first two years of life, a literature that had not been recently reviewed with a focus on this specific developmental window. The findings show that this association, while meaningful, is modest and heterogeneous, and that its magnitude depends on how outcomes are captured and when they are assessed, as well as on the family and sociodemographic context in which early development takes place. The findings also support the view that maternal depression should not be understood only as a postnatal risk factor, but as a process unfolding across the transition to motherhood, given that both prenatal and postnatal depressive symptoms showed comparable associations with early child outcomes (Guyon-Harris et al., 2016; Morales et al., 2023).

Building on the meta-analytic evidence, the longitudinal studies point to a pattern in which maternal depressive symptoms are more consistently linked to negatively toned aspects of early functioning than to positive ones in the first two years of life (Honda et al., 2023; Phua et al., 2023). This asymmetry is visible across both the socio-emotional developmental domain (Studies 1 and 4) and the relational domain (Study 3), and holds longitudinally across contexts where such patterns have been less frequently examined. By documenting this pattern across both domains, over time, and in underrepresented contexts, the thesis contributes to a more differentiated

understanding of how perinatal depression shapes early development, suggesting that its effects may be better understood as an intensification of difficulty-related processes than as a uniform reduction of positive functioning. At the same time, positive aspects of early functioning appear to follow a different developmental logic, with prosocial behaviour more closely tied to socioeconomic resources and neighbourhood conditions (Study 4), and perceived warmth more sensitive to child characteristics and community context (Study 3) than to maternal depressive symptoms alone.

The examination of the relational domain (Study 3) extends the theoretical framework of the mother–child relationship by bringing greater focus to its representational dimension within a longitudinal and cross-cultural context. The findings contribute to the understanding that maternal representations of the child and the relationship constitute a relevant pathway through which maternal depressive symptoms become linked to early relational functioning, particularly in relation to negatively toned representations. At the same time, associations with mind-mindedness appeared less consistent and more dependent on individual and contextual factors (McMahon & Bernier, 2017; Georg et al., 2023), contributing to explaining why previous studies on this link have produced mixed findings. These patterns suggest that the relational domain may not operate as a unitary construct, and that different relational processes may vary in how directly they are linked to maternal depressive symptoms and in how strongly they depend on the caregiving context.

In terms of early caregiving (Study 2), the thesis extends a literature that has so far yielded mixed findings on the association between prenatal depressive symptoms and breastfeeding (Dias & Figueiredo, 2015; Butler et al., 2021). By testing a more integrative explanatory model that includes both maternal–fetal attachment and postnatal depressive symptoms as potential pathways

(Brandon et al., 2009; Trombetta et al., 2021), the thesis offers a more refined understanding of how prenatal depressive symptoms may become relevant for breastfeeding behaviour. Results show that postnatal continuity in depressive symptoms represents the more consistent mechanism, whereas the role of maternal–fetal attachment appears to be more context-dependent.

A final theoretical contribution concerns the role of sociocultural context. Internalising problems and total socio-emotional difficulties were linked to maternal distress across most countries after adjustment, suggesting these outcomes represent relatively stable expressions of vulnerability. A similar pattern was evident in the relational domain, where more strained maternal representations were linked to maternal distress across several sites, including Ghana, Jamaica, Romania, and Vietnam. In contrast, other outcomes showed more pronounced contextual variation: aggression appeared more closely tied to neighbourhood conditions than to maternal depressive symptoms in Ghana, and prosocial behaviour in Romania was associated with maternal age and child sex rather than with maternal distress. The relevance of MFA also differed across sites, emerging as a significant pathway in the Philippines, South Africa, and Sri Lanka but not across all countries. Contextual variation was especially visible in mind-mindedness, where associations with maternal depressive symptoms emerged only when individual and contextual factors were considered, and only in the Philippines, Sri Lanka, and Vietnam. Mean levels of mind-mindedness also differed across settings, suggesting that local caregiving expectations and cultural norms may shape when this dimension becomes visibly linked to maternal distress. Taken together, these findings show that perinatal depression should not be understood either as a fully universal risk or as a purely context-specific one, but requires attention to both regularities and meaningful contextual variation.

4.2 Methodological Contributions and Practical Implications

4.2.1 Methodological Contributions

At the methodological level, an important strength of the present thesis was that it combined two complementary forms of evidence: a meta-analysis and longitudinal empirical studies. This was methodologically important because it allowed the research questions to be approached both through a synthesis of the existing literature and through prospective analyses based on multisite longitudinal data. The longitudinal design made it possible to examine maternal depressive symptoms during pregnancy, at 6 months postpartum, and at 24 months postpartum, allowing the distinction between prenatal symptom severity and later changes in maternal depressive symptoms across early motherhood.

The thesis also has methodological relevance through its multisite design. By using data from LMIC settings, it extends a literature that has more often relied on samples from high-income countries. This is important not only because it increases the diversity of the evidence base, but also because it allows the associations under study to be examined in a wider range of sociocultural contexts. In this sense, the thesis contributes to a field in which multisite longitudinal evidence from LMICs remains relatively limited.

The analytical strategy combined pooled analyses with country-level analyses, making it possible to examine both the more general patterns observed across the full sample and the way in which associations appeared within individual country contexts. The use of adjusted models including sociodemographic and community covariates further allowed associations to be examined in relation to the wider context of early development.

A further methodological contribution concerns the attention given to measurement in cross-cultural longitudinal research: the evaluation of the PHQ-9 across waves and sites showed

that instruments may not function identically across contexts, highlighting the importance of examining how constructs are captured in each setting rather than assuming equivalence (Murray et al., 2022).

4.2.2 Practical Implications

At the practical level, the present thesis suggests that maternal depressive symptoms may deserve attention across a wider segment of early motherhood, from pregnancy to the toddler years, rather than only at a single moment. The findings indicated that maternal depressive symptoms were relevant not only to children's socio-emotional development, but also to caregiving and relational processes, supporting the importance of early identification and continued attention to maternal mental health across this period. In practical terms, this supports approaches in which maternal depressive symptoms are not assessed only once, but are followed across key developmental moments in routine services that already come into contact with mothers during pregnancy and early childrearing. These findings do not suggest that responsibility for early outcomes should be placed primarily on mothers, rather, they support forms of screening and follow-up oriented toward identifying needs and facilitating support, without increasing pressure, blame, or surveillance of mothers.

A second practical implication is that prevention and early support programmes in early motherhood may benefit from extending their focus beyond maternal symptom reduction alone. Across the thesis, maternal depressive symptoms were linked not only to children's socio-emotional development, but also to breastfeeding exclusivity, mothers' representations of the child and of the mother-child relationship, and mind-mindedness. This suggests that programmes addressing maternal distress may be strengthened if they also take into account the caregiving and relational domains in which these associations were observed.

The contextual variability in findings further underscores that support for mothers and children may not be equally effective when based on a one-size-fits-all model: local, relational, demographic, and community conditions through which maternal distress becomes relevant in each setting deserve explicit consideration. At the same time, cultural and community contexts may be relevant not only as sources of risk, but also as possible sources of support, protection, and adaptive caregiving practices that deserve greater attention when practical responses are developed (Maselko et al., 2020; Zou et al., 2024).

4.3 Limitations and Future Research

4.3.1 Limitations

The present thesis also has several limitations that should be considered when interpreting the results. Because Studies 2–4 were based on the same longitudinal sample, several limitations apply across these empirical studies, although they became visible somewhat differently depending on the outcome examined.

A first limitation concerns the observational nature of the empirical studies. Prenatal depressive symptoms were assessed before all outcomes examined across the thesis, which provides a temporal basis for interpreting the observed associations. At the same time, the later change scores (W2 and W3) were assessed concurrently with the relational and developmental outcomes at W3 and bidirectional influences cannot be excluded. The findings should therefore be interpreted as associations rather than as causal pathways.

A second limitation concerns measurement across diverse sociocultural contexts. The inclusion of multiple LMIC settings is an important strength of the thesis, but it also brings challenges for the assessment of maternal depressive symptoms and early developmental processes across different cultural environments. The PHQ-9 did not show equally strong psychometric

performance across all sites, which may have influenced the observed associations. At the same time, this is also informative from a cross-cultural perspective, as it highlights the importance of examining how instruments function across settings.

A third limitation concerns shared method variance across the empirical studies. In Studies 2–4, both maternal depressive symptoms and the main outcomes were based on maternal report, whether referring to breastfeeding exclusivity, maternal representations, mind-mindedness, or children's socio-emotional development. This means that higher levels of maternal distress may also have influenced how these outcomes were perceived or reported. Future research would benefit from including more observational measures and additional informants. A further limitation concerns the level of detail with which socio-emotional outcomes were assessed: the Social Behaviour Questionnaire (SBQ) includes multiple subscales assessing difficulties and only one subscale reflecting positive competencies, which may have contributed to greater sensitivity in detecting associations with problem-related outcomes than with prosocial behaviour.

Another limitation concerns sample attrition across waves. The reduction at Wave 3 was due in part to the smaller number of countries participating in the final wave and to the conditions under which data collection took place during the COVID-19 pandemic, which may have reduced statistical power in country-specific analyses and influenced the measures collected at that wave through pandemic-related stress and disruptions to daily routines and access to services.

4.3.2 Future Research

One important direction for future research is to study the mechanisms through which maternal depressive symptoms become linked to early development. In the present thesis, maternal depressive symptoms were examined in relation to breastfeeding exclusivity, maternal-fetal attachment, mothers' representations of the child and the mother–child relationship, mind-

mindfulness, and children's socio-emotional development. However, these processes were not examined together within the same explanatory model, which means that it remains unclear whether some of them help explain the links between maternal depressive symptoms and later child outcomes. Future studies could therefore investigate more directly whether these caregiving and relational processes mediate these associations, and whether their role differs across developmental periods.

A second direction is to study maternal depressive symptoms across time with greater temporal resolution. The present thesis distinguished between prenatal symptom severity and subsequent changes across early motherhood, but future studies could use more frequent repeated assessments and examine whether different patterns of continuity, increase, or improvement in maternal distress are associated in different ways with caregiving, maternal representations, and children's socio-emotional development, thereby clarifying whether some periods within early motherhood are more sensitive than others. A further direction is to strengthen the assessment of the main constructs, for example, by combining self-report measures with clinical or interview-based approaches, incorporating observational methods and reports from additional informants, and further examining how measures perform across different sociocultural contexts.

Future research would also benefit from examining a wider range of influences highlighted by the Socio-Ecological Model in more integrated longitudinal designs in LMIC settings. At the individual level, future studies could examine maternal coping, emotion regulation, and other aspects of maternal psychological functioning beyond depressive symptoms alone. At the family level, paternal mental health, partner relationship quality, and specific parenting practices may help clarify how maternal distress becomes linked to caregiving, relational processes, and child development. At the community level, access to services, informal support networks, and

availability of practical support for mothers with young children deserve attention, especially in settings where resources may be more limited or unevenly distributed. At the sociocultural level, norms and beliefs related to breastfeeding, caregiving, motherhood, and child behaviour may be important for understanding why these associations appear differently across settings.

Building on the multisite design of the present thesis, future work should continue to prioritise LMIC settings to improve the global representativeness of the evidence base and to examine cultural influences that may function not only as sources of risk, but also as sources of support and adaptive caregiving practices.

4.4 Conclusions

The present thesis brought together evidence on how maternal depressive symptoms are related to early development across the first years of life. It examined this question through both a meta-analytic synthesis and longitudinal empirical studies, while also extending it to sociocultural contexts that remain less represented in the literature. Across the four studies, the findings suggest that maternal depressive symptoms are relevant not only for a single outcome or a single moment in time, but across multiple domains that are important for children's early development. At the same time, the thesis shows that this relevance is shaped not only by the initial severity of symptoms, but also by how they evolve across early motherhood.

The findings indicate that these associations are not uniform. Within the relational domain, maternal depressive symptoms were more consistently linked to more strained or negatively toned representations of the child and the relationship than to reduced perceived warmth. Within the socio-emotional developmental domain, the pattern was clearer for socio-emotional and behavioural difficulties than for positive competencies, which appeared more closely tied to contextual resources. The caregiving findings also suggest that maternal depressive symptoms may

become relevant through pathways that are not identical across contexts. Taken together, these distinctions support a more nuanced understanding of when and how maternal depressive symptoms become developmentally relevant, and of where support may matter most.

Finally, the variation observed across the LMIC settings included in the thesis reinforces the importance of understanding maternal mental health within its sociocultural context. Although the general direction of associations was often similar, the pathways through which maternal depressive symptoms became relevant were not identical across settings. This suggests that maternal mental health in early motherhood should not be understood as a uniform developmental risk with the same expression in all contexts. Although further research is needed to clarify the mechanisms involved, the present thesis shows that perinatal maternal depression may become relevant for early development in ways that differ across domains and contexts, while also providing a useful basis for future work and for more informed directions for supporting mothers and children as early as possible.

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