

# Defying the odds: Child health and wellbeing in the context of maternal depression

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BOSTON COLLEGE  
School of Social Work

DEFYING THE ODDS: CHILD HEALTH AND WELLBEING  
IN THE CONTEXT OF MATERNAL DEPRESSION

A dissertation  
by

SARAH J. DOW-FLEISNER

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of the requirements for a degree of  
-Doctor of Philosophy

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**Dissertation Chair: Dr. Summer Sherburne Hawkins**

**Abstract**

Preventing poor health in childhood is a national social work and public health priority in the United States. Importantly, child health and wellbeing is explicitly linked with maternal health. Thus, maternal depression, a common mental illness, is a concern not only for the mother, but for the health of her offspring. The purpose of this three-paper dissertation was to extend the understanding of child health and wellbeing at age 9 years old in the context of maternal depression. Analyses utilized data from the Fragile Families and Child Wellbeing study and were guided by a resilience perspective, life course perspective, family systems theory, and ecological systems theory. Paper 1 examined the unique impact of maternal depression on child physical health outcomes utilizing a series of logistic regression analyses. Findings indicated that multiple individual-, maternal-, and family-level risk and protective factors influenced the association between maternal depression and child physical health. Paper 2 utilized latent profile analysis and multinomial logistic regression analyses to examine child physical health and psychosocial wellbeing in the context of maternal depression. Five distinct profiles of child health and wellbeing were identified, suggesting the traditional dichotomy of healthy versus unhealthy may fail to

capture the complex nature of child health and wellbeing for those experiencing maternal depression. Results showed that maternal depression was associated with increased risk of poor health and wellbeing, yet also emphasized the ability for children to achieve resilient functioning. Paper 3 explored the impact of maternal depression on the maternal-child relationship and the protective nature of interpersonal supports and community resources. Findings indicated that interpersonal and community resources directly and indirectly supported a positive maternal-child relationship for mothers with depression. Altogether, results extend the literature base by providing a more nuanced and complete examination of child health and wellbeing in the context of maternal depression, with a focus on the potential for resilient functioning among this at-risk population. Findings provide evidence that even in the context of risk, protective factors exist that support resilient functioning. Results have important policy and practical implications, including continued screenings for maternal depression in a primary care setting.

## **DEDICATION**

To my loves, Mo and Cami.

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## **Chapter I. Introduction**

### **Statement of the Problem: Child Health and Wellbeing**

Childhood is a critical period that sets the pathway for developmental trajectories and outcomes and also forms the foundation for physical, psychosocial, and behavioral health and wellbeing across the life course (Center on the Developing Child, 2010; Shonkoff, Boyce, & McEwen, 2009). Despite significant decreases over the past century in infant and child morbidity and mortality in the United States (US), maintaining child health and wellbeing remains an important challenge (Hawkins et al., 2015; Rosenbaum & Blum, 2015). Of the 74 million children in the US (Federal Interagency Forum on Child and Family Statistics, 2015), nearly 1 in 3 are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014), 13.5% have a lifetime diagnosis of asthma (Bloom & Freeman, 2015), and 16% are reported as not having optimal health (US Department of Health and Human Services, 2015). Additionally, up to 1 in 5 children in the US experience a mental illness diagnosis each year, including both internalizing and externalizing disorders (Perou et al., 2013). Furthermore, the rates of poor health and wellbeing increase over the life course, highlighting the importance of preventing poor health and maintaining a trajectory of positive health and wellbeing throughout childhood (Bloom & Freeman, 2015; Hawkins et al., 2015; Ogden et al., 2014; US Department of Health and Human Services, 2015).

Child health and wellbeing is a multidimensional construct related to individual functioning that can be used to evaluate both progress and decline over time, as well as to inform early intervention and prevention programs (Moore, Murphey, Bandy, & Lawner, 2014; Rosenbaum & Blum, 2015). Health and wellbeing includes both positive and

negative indicators related to physical, as well as psychological and social (herein psychosocial) outcomes (Moore, Murphey, & Bandy, 2012; Moore et al., 2014; US Department of Health and Human Services, 2015). Common physical health indicators include overall health status, weight status, and the presence of chronic health conditions, like asthma (Moore et al., 2014; US Department of Health and Human Services, 2015). Indicators of child psychosocial wellbeing typically include the presence of internalizing (e.g. depression) and externalizing (e.g. behavior problems) disorders, as well as the presence of prosocial behaviors (Moore et al., 2014; US Department of Health and Human Services, 2014).

Child health and wellbeing is important not only in its own right, but also for understanding disease and disorder in adolescence and adulthood (Center on the Developing Child, 2010; Rosenbaum & Blum, 2015). Poor child health and wellbeing, including weight problems, chronic health issues, and mental illness, are directly associated with illness and disease across the life course (Kaiser Family Foundation, 2016; Proimos & Klein, 2012; Shonkoff et al., 2009). For example, childhood weight problems and asthma substantially increase the risk of adult health problems, like type 2 diabetes, hypertension, cardiovascular disease, and pulmonary and chronic respiratory diseases (Shonkoff et al., 2009). Cardiovascular disease, chronic respiratory disease, and diabetes are noncommunicable diseases that are a combination of genetic, physiological, environmental, and behavioral factors that account for over 80% of all premature deaths annually and are estimated to cost a cumulative loss of \$47 trillion dollars globally between 2011 and 2030 (Bloom et al., 2011; Kaiser Family Foundation, 2016). Nearly two-thirds of all premature deaths and preventable illnesses in adulthood are related to

health conditions and behaviors initiated in childhood (Proimos & Klein, 2012; Rosenbaum & Blum, 2015). Given that many of the conditions leading to poor health among US adults have roots in early childhood experiences, this suggests the potential for these illnesses to be prevented if detected and treated early.

### **Context of Child Health and Wellbeing**

During childhood, the family is one of the largest direct factors influencing the health and wellbeing of the individual child (Bronfenbrenner, 1986; Grusec, 2011; Repetti, Taylor, & Seeman, 2002). Early family relationships shape how children learn social norms, develop skills to cope with stress, and establish health-promoting behaviors (Grusec, 2011; Laible, Thompson, & Froimon, 2015). Experiences within the family are essential for determining how children grow and develop, with family members as key socializing agents and models for young children (Laible et al., 2015; Maternal & Child Health Bureau, 2010). As such, the health and wellbeing of those family members, in particular the mother, are important determinates for the health and wellbeing of the child (Gladstone, Beardslee, & Diehl, 2015; Goodman et al., 2011; Hardie & Landale, 2013; Hardie & Turney, 2017; Reupert & Maybery, 2007).

Maternal physical health and psychosocial wellbeing, though not necessarily direct indicators, are considered important factors influencing child health and wellbeing (Duncan, Hagan, & Shaw, 2008; Moore et al., 2014; Rosenbaum & Blum, 2015). As such, maternal mental and physical illness may negatively impact her offspring. More specifically, maternal depression represents a significant mental health concern that a woman may experience while parenting that can have detrimental effects on her child (Danese & McEwen, 2012; Felitti, 2009; Gladstone et al., 2015; Goodman et al., 2011;

Turney, 2011a; Wang, Wu, Anderson, & Florence, 2011). Major depressive disorder is the most common mental illness in the US, with a lifetime prevalence of 20.9% and a 12-month prevalence of 9.3% for individuals aged 18-64, with rates nearly double among women (Kessler, Petukhova, Sampson, Zaslavsky, & Wittchen, 2012). Importantly, the onset of depressive symptoms for women most often occurs between the ages of 20 and 40 (Marcus & Heringhausen, 2009), which coincides with the average childbearing age for women in the US (Martinez, Daniels, & Chandra, 2012).

Specifically among mothers, 10% will experience an episode of depression in a given year (Ertel, Rich-Edwards, & Koenen, 2011; Pratt & Brody, 2014). Rates of depression in mothers are significantly higher during the first year directly after birth (20%), and then decrease and remain consistent around 10% in the years following (Ertel et al., 2011). Living with a mother with depression is a unique, yet not uncommon experience for children, with an estimated 1 in 10, or over 7 million, children experiencing maternal depression annually (Ertel et al., 2011). However, these rates may be slightly underestimated, given that some women may not seek help or receive a diagnosis (England & Sim, 2009; Pratt & Brody, 2014). Also, given that many women will have more than one child (Monte & Ellis, 2014), potentially more than 1 in 10 children are experiencing maternal depression annually.

Of note, diagnosing depression in mothers takes into account the timing of symptom onset with the birth of the child by including a specifier for onset that occurs during the last month of gestation and the first four weeks after childbirth, referred to as peripartum onset (also called postpartum depression) (American Psychiatric Association, 2013). The shift from the postpartum to peripartum onset specifier reflected that the

majority of “postpartum” depressive episodes typically began prior to delivery (American Psychiatric Association, 2013). Depression with peripartum onset may continue throughout the child’s first year or longer (American Psychiatric Association, 2013; O’Hara & McCabe, 2013). Additionally, some mothers may have experienced depression prior to becoming pregnant, which can increase the risk of depression during pregnancy and following childbirth (Ertel et al., 2011; O’Hara & McCabe, 2013). This dissertation focused on maternal depression occurring any time after the focal child’s birth, with an emphasis on depression occurring later in childhood.

The symptoms of depression include dysphoria and anhedonia, as well as others related to depressed affect, somatic complaints, and interpersonal difficulties (American Psychiatric Association, 2013). The functional impairment associated with depression may lead to financial hardship, food and housing insecurity, and marital discord, all of which may have direct and indirect impacts on the child (Gladstone et al., 2015; Reupert & Maybery, 2007). Additionally, depression may impact the mother’s ability to provide consistent parenting and a healthy environment for her child (Duncan et al., 2008). More specifically, maternal depression may negatively impact multiple aspects of the child-rearing environment, including the ability to meet basic emotional and physical needs, maintain consistent parenting practices, and model adaptive coping strategies (Ertel et al., 2011; Goodman et al., 2011; Turney, 2012a). Depressive symptoms may be chronic or acute, and may occur at any stage of the child’s life (Ertel et al., 2011; Turney, 2012b; Wang et al., 2011).

### **Maternal Depression and Child Wellbeing**

The negative impact of maternal depression on child health and wellbeing has

been well-documented (Ertel et al., 2011; Gladstone et al., 2015; Goodman et al., 2011; Lampard, Franckle, & Davison, 2014; Reuben & Shaw, 2015; Turney, 2012a; Weissman et al., 2016). Maternal depression during infancy and toddlerhood is associated with lower rates of secure attachment and greater rates of withdrawn behaviors in children (England & Sim, 2009; Gladstone et al., 2015). Depression during the postpartum period has been linked to lower levels of social competence among school-aged children (Luoma et al., 2001). Additionally, a meta-analysis of 193 studies published between 1982 and 2009 found that maternal depression was significantly related to higher levels of psychopathology, problem behaviors, and internalizing and externalizing disorders in children (Goodman et al., 2011). Also, maternal depression has been linked to increased rates of physical health problems, like frequent headaches, stomachaches, asthma, and overall poorer health in children (England & Sim, 2009; Gladstone et al., 2015; Turney, 2011b; Turney, 2012a). A review of nine prospective studies found that maternal depression was associated with increased rates of childhood overweight (Lampard et al., 2014). Furthermore, maternal mental illness, including depression, has been identified as an adverse childhood experience that can lead to both immediate and long-term physical and psychological consequences (Danese & McEwen, 2012; Felitti, 2009; Gilbert et al., 2015; Gladstone et al., 2015). Maternal depression has the potential to negatively impact developmental trajectories and outcomes, leading to costly lifelong problems that may be more difficult to address in adolescence and adulthood (Goodman et al., 2011; Hawkins et al., 2015; Lampard et al., 2014).

While maternal depression has been identified as a significant risk factor for poorer outcomes in children, it is imperative to note that many children exposed to

maternal depression do not have negative outcomes (Gladstone et al., 2015; Goodman et al., 2011; Lampard et al., 2014; Reupert & Maybery, 2007). Furthermore, children experiencing the risk associated with maternal depression may display resilient functioning in one or more domains of child health and wellbeing (Gladstone et al., 2015; Goodman et al., 2011; Reuben & Shaw, 2015; Reupert, Drost, Nicholson, & van Doesum, 2014). Importantly, other factors may mitigate or potentiate the relationship between maternal depression and child outcomes. Understanding the ways in which children experiencing maternal depression exhibit resilient functioning is exceptionally important for prevention efforts and early intervention programs. Identifying the factors leading to resilient functioning provide insight into the processes that should be enhanced and addressed to improve child outcomes (Reuben & Shaw, 2015; Reupert et al., 2014). Early intervention and prevention programs can improve child health and wellbeing by reducing negative health problems and by promoting positive health behaviors.

### **Dissertation Purpose and Aims**

While the impact of maternal depression on child health and wellbeing has been well-studied, there are some important gaps that should be addressed. Broadly, this three-paper dissertation aimed to extend the understanding of child health and wellbeing in the context of maternal depression. The first paper of this dissertation investigated the association between maternal depression and child physical health outcomes after the postpartum period, taking into account multiple risk and protective factors. The second paper identified and described latent profiles of child physical health and psychosocial wellbeing including positive and negative indicators, thereby developing a more comprehensive and nuanced understanding of child health and wellbeing in the context of

maternal depression. Finally, the third paper explored the maternal-child relationship, a key factor influencing child health and wellbeing, among mothers with depression, with a specific focus on environmental factors that support this relationship. These three studies taken together addressed some important gaps in the literature by focusing on outcomes in later childhood, including the influence of multiple risk and protective factors, developing a more nuanced conceptualization of child health and wellbeing, and by examining the maternal-child relationship in greater detail.

First, instead of utilizing a traditional deficit approach (i.e. risk conferred by maternal depression), this dissertation utilizes a strengths-based perspective (i.e. resilient functioning in the context of risk) that examines the potential for positive outcomes and takes into account the importance of other contextual factors. To date, the majority of research on maternal depression has focused solely on the risk conferred by depression rather than the potential for children to be resilient (Gladstone et al., 2015; Reuben & Shaw, 2015; Reupert et al., 2014). Relatively few studies have examined how children experiencing maternal depression may exhibit and achieve resilient functioning (Ertel et al., 2011; Goodman et al., 2011; Reuben & Shaw, 2015; Weissman et al., 2016). Among those that do, the typical focus is the absence of negative outcomes rather than the presence of positive ones, such as prosocial behaviors (Reuben & Shaw, 2015). However, child health and wellbeing is a multidimensional construct that should consider multiple positive and negative indicators (Moore et al., 2012; Moore et al., 2014; US Department of Health and Human Services, 2015). Likewise, research examining the impact of maternal depression on child wellbeing often lacks the inclusion of other confounding factors that may be impacting child health outcomes (Gladstone et al., 2015; Reuben &

Shaw, 2015; Reupert et al., 2014). When considering the risk associated with maternal depression, it is important to take into account other contextual risk factors (e.g. poverty) and protective factors (e.g. positive relationships) that may be impacting both child and mother outcomes.

Second, most studies examining maternal depression focus primarily on depression occurring during infancy (0-1 year old), toddlerhood (1-3 years old), and early childhood (3-5 years old), which is when the rate of maternal depression is highest (20%) (Gladstone et al., 2015; Goodman et al., 2011). However, given that the rate of maternal depression remains around 10% later in childhood, it is equally important to consider the impact on child outcomes during this time (Ertel et al., 2011; Pratt & Brody, 2014). As such, this dissertation added to the existing literature by focusing specifically on depression occurring later in childhood. Similarly, many studies examine child outcomes focus on those occurring in early childhood, with a secondary focus on how experiencing depression in early childhood impacts outcomes in adolescence and adulthood (Gladstone et al., 2015; Goodman et al., 2011). This dissertation focused specifically on outcomes for children in middle-late childhood (8-11 years old), as this is a period that has been largely understudied in maternal depression research (Goodman et al., 2011; Turney, 2011b) and may be when early indicators of potential long-lasting physical and psychosocial health problems arise (Hawkins et al., 2015; Rosenbaum & Blum, 2015).

Finally, the maternal-child relationship is a key pathway through which maternal depression impacts child health and wellbeing (England & Sim, 2009; Gladstone et al., 2015; Goodman et al., 2011; Turney, 2011b). As such, it is important to examine how the maternal-child relationship differs between depressed mothers and non-depressed

mothers, and the ways in which depressed mothers maintain a positive relationship with her child. This dissertation was grounded in four theoretical frameworks: 1) life course perspective, 2) family systems theory, 3) ecological systems theory, and 4) resilience perspective. Additional discussion of these theoretical frameworks is provided within each paper individually.

### **Data Source: Fragile Families and Child Wellbeing (FFCWB) Study**

This dissertation utilized data from the Fragile Families and Child Wellbeing (FFCWB) study (Reichman, Teitler, Garfinkel, & McLanahan, 2001; Waldfogel, Craigie, & Brooks-Gunn, 2010), a longitudinal study of mostly single mothers. The FFCWB study is a birth cohort study of children born to mainly single mothers in 75 hospitals in 20 medium to large US cities between 1998 and 2000 (Reichman et al., 2001; Waldfogel et al., 2010). The FFCWB study includes nearly 5,000 biological mothers interviewed at or around the time of the focal child's birth (baseline), with follow-up interviews conducted when the child was around the ages of 1-, 3-, 5-, and 9-years-old (Bendheim-Thoman Center for Research on Child Wellbeing, 2008; Bendheim-Thoman Center for Research on Child Wellbeing, 2011). Interviews consisted of core telephone interviews and in-home face-to-face interviews with completion rates for mothers of 89%, 86%, 85%, and 76% at the 1-, 3-, 5-, and 9-year follow-ups, respectively (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

The FFCWB study includes indicators related to child physical health and psychosocial wellbeing, maternal health and wellbeing, economic and employment status, parenting behaviors, social support and neighborhood cohesion, and other sociodemographic characteristics (Bendheim-Thoman Center for Research on Child

Wellbeing, 2011). A description of the variables used is provided in each paper individually. Finally, the secondary data analyses using the FFCWB public data were approved by the Boston College Institutional Review Board (IRB) on October 1, 2015.

## ***Chapter II. Child Physical Health Outcomes and Maternal Depression: Examining the Influence of Other Risk and Protective Factors***

Paper 1 examined the associations between maternal depression and three indicators of child physical wellbeing at age 9 years old taking into account the impact of confounding child-, maternal-, and family-level risk and protective factors, as well as two factors related to the maternal-child relationship. This study was framed using family systems theory (Cox & Paley, 1997; Cox & Paley, 2003; Minuchin, 1985) and a resilience perspective (Masten, 2001; Masten, 2013). From a family system framework, family members are interconnected subsystems, as such, the mental health of the mother may have a major impact on the health and wellbeing of her offspring (Cox & Paley, 2003; Minuchin, 1985). Additionally, from a resilience perspective, children exposed to multiple risk factors have increased chances of poor outcomes, whereas the presence of protective factors may mitigate risk and support optimal health outcomes (Masten, 2013; Reuben & Shaw, 2015). Children experiencing maternal depression may have additional risk factors leading to negative outcomes, as well as protective factors supporting positive outcomes despite the risk associated with maternal depression (Reuben & Shaw, 2015; Reupert et al., 2014).

The purpose of this study was two-fold: first, to determine the impact of maternal depression on three indicators of child physical health, and second, to identify modifiable risk and protective factors related to child physical health, including the role of the

maternal-child relationship. More specifically, this study examined the association between maternal depression and child overall health status, overweight (including obesity), and diagnosis of asthma, controlling for sociodemographic characteristics and other child-, mother-, and family-level factors. Previous studies examining the risk of maternal depression have focused almost exclusively on child social and emotional outcomes, with few examining the impact on physical health outcomes (Goodman et al., 2011; Turney, 2011b). For many children, physical health outcomes may precede social and emotional problems and are more readily detected by primary healthcare providers.

As such, Paper 1 adds to the current literature base by examining the association between maternal depression and child health by focusing specifically on child physical health outcomes, which have been largely understudied. Additionally, these analyses included multiple risk and protective factors that may influence the degree to which maternal depression impacts child physical health. These analyses also provide insight as to the influence of other risk and protective factors potentiating or mitigating the risk associated with maternal depression. This study goes beyond the traditional deficit approach by including other risk and protective factors in order to examine the ways in which these factors attenuate the risk between maternal depression and child physical health outcomes.

Data included child physical health outcomes and maternal depression diagnosis from the FFCWB 9-year follow-up interview. Child health and health behaviors, maternal health factors, and maternal-child relationship variables were from the 9-year follow-up interview, and sociodemographic characteristics were from the baseline and 1-year follow-up interviews. Child physical health outcomes included overall health status,

weight status, and the presence of asthma, a chronic physical health illness, that were collected at each wave by trained interviewer (e.g. weight status) or by mother-report (e.g. overall health and asthma). At age 9 years old, child health behaviors included sleeping patterns, physical activity, and eating habits collected by mother-report. Finally, past 12-month depression diagnosis for mothers was measured using the World Health Organization (WHO) Composite International Diagnostic Interview-Short Form (CIDI-SF) (World Health Organization, 1994) at each follow-up (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

Analyses included unadjusted ordered logistic and logistic regression analyses to explore the associations between maternal depression and three indicators of child physical wellbeing. We utilized a stepped ordered logistic and logistic regression analyses approach, adding blocks of variables related to sociodemographic characteristics, child health and health behaviors, maternal health factors, and factors related to the maternal-child relationship. For the stepped ordered logistic and logistic regression analyses, the coefficient for maternal depression was examined for changes upon adding each variable block to the model. Additionally, a Karlson-Holm-Breen (KHB) mediational model (Breen, Karlson, & Holm, 2013) was used to determine the strength and degree of mediation between maternal depression and child overall health explained by factors related to the maternal-child relationship. Finally, coefficients for individual predictors in the full ordered logistic and logistic regression models were examined for each physical health outcome. The final sample size for Paper 1 included 2,965 observations from the 9-year follow-up.

### ***Chapter III. Latent Profiles of Child Health and Wellbeing in the Context of Maternal***

## *Depression*

Importantly, child physical health and psychosocial wellbeing are interconnected. As such, Paper 2 developed profiles of child health and wellbeing at age 9 years old using multiple positive and negative indicators of physical and psychosocial health, and then examined the differences in profiles based on experiences of maternal depression. Paper 2 was framed using a resilience perspective. From a resilience perspective, it is important to consider the heterogeneity in how individuals adapt in the context of stressful situations (Liebenberg & Ungar, 2009; Masten, 2013), like maternal depression. There are two basic assumptions of the resilience perspective: 1) that the individual must be exposed to risk and 2) that individuals adapt to risk differently, including the ability to achieve resilient functioning (Masten, 2001; Masten, 2013). Those experiencing risk who avoid negative or achieve positive outcomes in a particular health domain are considered to be displaying resilient functioning. Importantly, children may display resilient functioning for a single indicator or domain, but may be struggling in another. For example, a child may have good physical health and poor psychosocial wellbeing, suggesting resilient functioning in the physical domain and risk in the psychosocial domain. As it is unrealistic to assume that any child will consistently experience positive or negative outcomes across all domains, one should consider multiple aspects of health and wellbeing collectively (Masten, 2013; Reuben & Shaw, 2015).

Thus, the main purpose of this study was to generate a more complete understanding of child health and wellbeing in the context of maternal depression. Paper 2 developed comprehensive, multidimensional profiles of child health and wellbeing, taking into account multiple indicators related to both physical health and psychosocial

wellbeing for children aged 9 years old, and then examined differences in profiles based on experiences of maternal depression at ages 5 and 9 years old. Paper 2 extends the literature in three ways: 1) by using a multidimensional conceptualization of health and wellbeing using multiple physical and psychosocial health indicators, 2) focusing on both negative and positive indicators, and 3) utilizing a person-centered approach that identifies patterns of health and wellbeing among individuals.

To date, most research on the impact of maternal depression on child health and wellbeing focus on single indicators (e.g. weight status) or domains (e.g. physical versus psychosocial) of health and wellbeing (Goodman et al., 2011; Lampard et al., 2014; Reuben & Shaw, 2015). However, child health and wellbeing is a multidimensional construct that should be researched and treated as such (Moore et al., 2014). Child physical health and psychosocial wellbeing outcomes are related, yet represent distinct domains impacting individual functioning (Moore et al., 2012). Additionally, the majority of research examining the impact of maternal depression utilizes a traditional deficit approach, mainly focusing on how risk is conferred (Goodman et al., 2011; Lampard et al., 2014; Turney, 2011b; Turney, 2012a). Of those using a resilience perspective, the majority conceptualize resilience as the absence of negative outcomes, not the presence of positive ones (Gladstone et al., 2015; Masten, 2013; Moore et al., 2012; Reuben & Shaw, 2015; Reupert et al., 2014). However, good health and positive wellbeing are more than just the absence of negative outcomes (Moore et al., 2012). For instance, a child experiencing maternal depression may not have an internalizing disorder, but may lack prosocial skills. Accordingly, this study used a person-centered approach to identify classes of child physical health and psychosocial wellbeing, which highlight both risk and

resilient functioning that may be occurring simultaneously.

Data included child physical health and wellbeing from the FFCWB 9-year follow-up interview, and maternal depression diagnosis from the 5-year and 9-year follow-up interviews. Physical health indicators included mother- and child-reported overall health status, weight status (i.e. body mass index), and the presence of chronic health conditions (e.g. asthma, diabetes). Indicators of psychosocial wellbeing included the presence of internalizing and externalizing problems using scaled scores from the mother-reported Child Behavior Checklist (CBCL) (Achenbach & Rescorla, 2001) and child-reported Self-Description Questionnaire (SDQ) (Marsh, 1990). Finally, prosocial behaviors included mother-reported expressiveness scale score from the Adaptive Social Behavior Inventory (Hogan, Scott, & Bauer, 1992) and child-reported perseverance scale score from the SDQ. Past 12-month depression diagnosis for mothers was assessed using the World Health Organization (WHO) Composite International Diagnostic Interview-Short Form (CIDI-SF) (World Health Organization, 1994) collected at both the 5- and 9-year follow-ups (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). Additionally, a variable indicating change in depression status from year 5 to 9 was generated.

Latent profile analysis (LPA) was conducted using MPlus 7.4 (Muthén & Muthén, 2012). LPA is a person-centered approach that has been increasingly used in developmental research (Collins & Lanza, 2013; Lanza & Cooper, 2016). LPA generates mutually exclusive subgroups (i.e. latent profiles) of individuals with a similar pattern of responses to a set of observed indicators (Lanza & Cooper, 2016). In this study, LPA was used to identify and describe classes of child physical health and psychosocial wellbeing

based on multiple positive and negative indicators for children at the 9-year follow-up. Once profiles were determined, multinomial logistic regression analyses were conducted to examine the associations between health and wellbeing profiles and maternal depression at the 5- and 9-year follow-ups, as well as changes in depression between ages 5 and 9, controlling for covariates. The final analytic sample included 3,211 observations for the LPA. Multinomial logistic regression analyses included 3,090 observations for the 5-year maternal depression status, 3,019 observations for the 9-year maternal depression status, and 2,906 observations for the change in maternal depression status.

#### ***Chapter IV. Resilience in the Maternal-Child Relationship for Mothers Experiencing Depression***

Finally, Paper 3 examined the maternal-child relationship in the context of maternal depression for children aged 9 years old, including the impact of protective external factors supporting this important social bond. From an ecological systems perspective, the individual child is understood in the context of mutually reciprocal systems that directly and indirectly influence developmental trajectories and outcomes (Bronfenbrenner, 1986; Bronfenbrenner & Morris, 2006). An ecological systems perspective includes five major systems that surround the individual child: 1) microsystem (e.g. immediate family members), 2) mesosystem (e.g. relationship between individual and members of the microsystem), 3) exosystem (e.g. formal and informal supports), 4) macrosystem (e.g. ideologies and cultural norms), and 5) chronosystem (e.g. interactions between systems over time) (Bronfenbrenner, 1986; Bronfenbrenner & Morris, 2006). In this case, the mother represents a member of the microsystem and the mother-child relationship represents the mesosystem, whereas interpersonal supports and

community resources available to the mother are part of the exosystem.

The ecological systems perspective suggests that the individual child, members of the microsystem (e.g. mother), and the mesosystem (e.g. maternal-child relationship) are impacted by the availability of formal and informal supports in the exosystem. More specifically, the availability of interpersonal supports and community resources have the potential to impact the maternal-child relationship (Zhang, Eamon, & Zhan, 2015).

Previous literature has identified that few interpersonal supports and a lack of community resources may lead to negative outcomes for mothers and children individually (Dunst, Trivette, & Hamby, 2014; World Health Organization, 2014). However, few studies have examined the impact these factors may have on the maternal-child relationship, and by extension on child health and wellbeing, particularly in the context of maternal depression.

The aim of paper 3 was two-fold: first, to examine differences in three aspects of the maternal-child relationship: 1) perceptions of parenting, 2) parenting practices, and 3) parent involvement between depressed and nondepressed mothers, and second, to investigate how social supports and community resources impact these three aspects for mothers with current depression. The study extends the current literature in two main ways. First, while many studies have identified that maternal depression disrupts the maternal-child relationship, few have examined the mechanisms that support a positive maternal-child relationship for mothers with depression (Goodman et al., 2011; Kerker et al., 2016; Turney, 2012a; Villodas, Bagner, & Thompson, 2015). Given the importance of the maternal-child relationship and the potential negative effects of maternal depression, understanding how mothers maintain a positive relationship with her child is

essential for supporting optimal child health and wellbeing. Second, the conceptualization of the mother-child relationship represents three areas that may be most impacted by intervention programs and addressed by social workers and practitioners. Intervention programs can highlight realistic parenting expectations, address negative perceptions of parenting, provide training for using more adaptive parenting practices, and support ways for the mother to engage with her child.

Data related to the maternal-child relationship and maternal depression were drawn from the FFCWB 9-year follow-up interview and included covariates from the baseline and 9-year follow-up interviews. The maternal-child relationship included items related to three broad areas: 1) perceptions of parenting, 2) parenting practices, and 3) parent involvement. Perceptions of parenting included two separate scales related to perceived parenting stress (Abidin, 1995) and perceived parenting competence (Blumberg et al., 2005). Parenting practices included three subscales of the Parent-Child Conflict Tactics Scale (Straus, 1979) related to non-violent discipline, psychological aggression, and physical assault. Parent involvement included two scales related to mother involvement with the child in the home and at the child's school, including time spent together at home and events attended by the mother at the focal child's school. Interpersonal supports included two measures related to instrumental support (Reid & Taylor, 2015) and emotional support from family members and friends. Community resources included the Social Cohesion and Trust Scale (Sampson, Raudenbush, & Earls, 1997) related to perceptions of neighborhood environment and also included a single indicator item related to neighborhood safety.

Initial univariate and bivariate analyses were conducted to examine the

differences in each item related to perceptions of parenting, parenting practices, and parent involvement between mothers with past 12-month depression as compared to those without a current diagnosis of depression for children aged 9 years old. Then a series of regression analyses were conducted to examine the associations between each outcome related to the maternal-child relationship and interpersonal supports and community resources, controlling for covariates. Finally, a structural equation model was estimated to examine the direct and indirect impact of interpersonal supports and community resources on parent practices and involvement through perceptions of parenting, controlling for covariates. The initial sample included 3,212 observations for mothers who completed the 9-year follow-up interview. Subsequent multivariate regression analyses and structural equation modeling were conducted with 522 mothers meeting diagnostic criteria for past 12-month depression at the 9-year follow-up.

### **Conclusion**

Taken together, these three papers contribute to the understanding of child health and wellbeing in the context of maternal depression by utilizing advanced statistical methods guided by previous empirical evidence and supported by theoretical frameworks. This dissertation advances the knowledge base by focusing on previously understudied outcomes, developing a more complete understanding of child health and wellbeing, and investigating three aspects of the maternal-child relationship impacting child health outcomes. The three papers of this dissertation extend the literature by moving beyond only examining the risk associated with maternal depression and exploring the resilient processes occurring in the context of maternal depression later in childhood. The goal of Paper 1 was to establish the link between maternal depression and

child physical health outcomes later in childhood. Paper 2 aimed to build upon that work by developing a comprehensive, multidimensional conceptualization of child health and wellbeing, including both physical and psychosocial indicators in the context of maternal depression. Finally, Paper 3 took a birds-eye view by examining the maternal-child relationship, which has a major influence on child health and wellbeing, and exploring the protective factors supporting that relationship for mothers with depression. The concluding chapter of this dissertation provides a brief summary of key findings from each study, highlights important policy and practice implications, and discusses future directions for scholarship.

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## **Chapter II. Child Physical Health Outcomes and Maternal Depression: Examining the Influence of Other Risk and Protective Factors**

Ensuring that all children have a healthy start in life is an important social work priority (Hawkins et al., 2015), as poor physical health in childhood is one of the most robust predictors of adverse outcomes in adolescence and adulthood (Hardie & Landale, 2013; Shonkoff, Boyce, & McEwen, 2009). Poor physical health at any point throughout childhood may lead to impairments in daily functioning and increase the risk of morbidity and early mortality, resulting in substantial individual, economic, and social consequences and costs (Ogden, Carroll, Kit, & Flegal, 2014; US Burden of Disease Collaborators, 2013). Nevertheless, poor physical health in childhood remains a significant problem in the United States (US).

While the majority of parents report their child is in excellent or very good health, 16% of children are reported as not having optimal overall health (US Department of Health and Human Services, 2014). Additionally, nearly 1 in 3 children in the US are overweight or obese (Ogden et al., 2014) and 14% of children have a lifetime diagnosis of asthma, a chronic health condition associated with a decreased quality of life (Bloom & Freeman, 2015). Importantly, from early to middle childhood, there are significant increases in the rates of poor overall health, overweight, and asthma (Bloom & Freeman, 2015; Ogden et al., 2014; US Department of Health and Human Services, 2015). Poor overall health, overweight, and asthma in childhood are associated with negative consequences that may continue into adulthood (Shonkoff et al., 2009). Understanding the factors in childhood associated with poor physical health is essential for improving overall health and functioning throughout the life course.

## **Theoretical framework**

Many theoretical models have proposed a number of contextual factors leading to differences in physical health outcomes (Goodman & Gotlib, 1999; Parker, Baldwin, Israel, & Salinas, 2004). For young children, the family, particularly the mother, has the largest influence on overall child wellbeing, including physical health, as mothers are often the primary caregiver (Maternal & Child Health Bureau, 2010; Parker et al., 2004). From a family systems theory, family members are viewed as interconnected systems, meaning that difficulties experienced by an individual member has the potential to disrupt the wellbeing of others within the system (Cox & Paley, 1997; Cox & Paley, 2003). As such, examining the impact of maternal health factors, specifically maternal depression, as a dimension of child physical wellbeing may explain some of the differences in child physical health outcomes (Hardie & Landale, 2013; Turney, 2011).

Understanding the role of maternal depression on child physical wellbeing is important considering the prevalence of maternal depression beyond the postnatal period. In a given year, approximately 10-20% of mothers will have an episode of depression (American Psychiatric Association, 2013), with over 7.6 million children living with a mother with depression (Ertel, Rich-Edwards, & Koenen, 2011; Pratt & Brody, 2014). Depression is a psychiatric disorder characterized by persistent dysphoria and/or anhedonia, along with other somatic, psychological, and behavioral symptoms (American Psychiatric Association, 2013). Importantly, there is also a specifier for women if symptom onset occurs during the peripartum period (last month of gestation and the first four weeks after childbirth), commonly referred to as postpartum depression (American Psychiatric Association, 2013). While the timing of symptom onset is important, fewer

studies have examined the impact of maternal depression on child wellbeing occurring later in childhood, despite the fact that depression may be present at any time throughout childhood (Ertel et al., 2011; Turney, 2012).

By definition, maternal depression is a debilitating and persistent condition, leading to impairments in daily functioning for the mother, specially related to her physical health, family relationships, and social interactions (Farr & Bish, 2013; Pratt & Brody, 2014). Maternal depression is associated with lower levels of self-efficacy and decreased feelings of mastery (Farmer & Lee, 2011). As such, mothers with depression may perceive parenting as more stressful and may view herself as less able to parent effectively (Farmer & Lee, 2011). Maternal depression has also been consistently identified as a risk factor impacting child emotional and psychological wellbeing, with disruptions in the maternal-child relationship as the primary mechanism (Gladstone, Beardslee, & Diehl, 2015; Goodman et al., 2011; Reuben & Shaw, 2015).

Among the few studies that have examined the impact of maternal depression on child physical health outcomes, depression was associated with increased rates of poor child health, overweight, and asthma (Lampard, Franckle, & Davison, 2014; Repetti, Taylor, & Seeman, 2002; Turney, 2011). However, many of these studies did not include a comprehensive set of confounding factors or consider the impact of factors related to the maternal-child relationship, such as parenting stress and competence. From a resilience perspective, individuals may be affected by multiple risk and protective factors that interact with each other (Masten, 2001; Masten, 2013). As such, it is important to take into account additional factors that may both potentiate or mitigate the risk associated with maternal depression. A comprehensive set of factors are needed to

account for other contextual risks, like poverty, associated with increased rates of both maternal depression and poor child physical health outcomes (Ertel et al., 2011; Pratt & Brody, 2014; US Department of Health and Human Services, 2015). These other contextual factors must be accounted and controlled for in order to determine the unbiased association between maternal depression and child physical health outcomes.

### **Study Purpose and Aims**

Thus, the aims of this paper were to first, examine the associations between past 12-month maternal depression on three indicators of child physical wellbeing (overall health status, overweight, and asthma) among children aged 9 years old, and to second, identify other risk and protective factors related to child physical wellbeing, including the role of maternal perception of parenting stress and competence. To that end, this study goes beyond the traditional deficit approach by examining the ways in which other empirically and theoretically supported risk and protective factors influence the association between maternal depression and child physical health outcomes later in childhood.

### **Methods**

The Fragile Families and Child Wellbeing Study is an ongoing, longitudinal, cohort study following 4,898 children born in a US city between 1998 and 2000 to mostly unmarried parents (Reichman, Teitler, Garfinkel, & McLanahan, 2001; Waldfogel, Craigie, & Brooks-Gunn, 2010). Biological mothers were interviewed at or around the time of the focal baby's birth (baseline), with follow-up interviews conducted when the focal child was 1-, 3-, 5-, and 9-years-old. Interviews consisted of core telephone interviews and in-home face-to-face interviews. Of the 4,898 mothers initially

interviewed, 3,309 (67.6%) mothers completed the 9-year in-home primary caregiver interview (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

Present analyses included 2,965 mothers interviewed at the 9-year follow-up. Observations were excluded if data were missing on any of the sociodemographic variables ( $n = 312$ ) or maternal depression indicator ( $n = 12$ ), the child had a serious physical disability (e.g. Cerebral Palsy,  $n = 75$ ), and the child lived less than halftime with the mother ( $n = 213$ ). Some mothers satisfied more than one exclusion criterion. There were also 239 missing observations for child body mass index (BMI), with 162 children having not been measured and 77 flagged due to measurement errors. Observations with missing BMI data were excluded from that analysis only.

The analytic sample was compared to the 9-year follow-up sample on baseline characteristics related to child birth weight, breastfeeding duration, education levels, income, and marital status. The analytic sample had lower rates of low birth weight, longer breastfeeding duration, higher levels of maternal education, higher income, and were more likely to be married at baseline ( $p < .01$ ). Additionally, mothers who completed the 9-year follow-up interview, but were not included in the analytic sample were more likely to be depressed (24.0%) as compared to those in the analytic sample (16.3%),  $\chi^2(1) = 18.7, p < .001$ . This may be in part related to the fact that mothers excluded because her child was not living in the home at least half time had elevated rates of depression (31.8%). However, there were no differences in baby's sex, mother's age, and levels of parenting stress and competence between the excluded and those included in the analytic sample.

## Measures

***Child physical wellbeing.*** Outcome measures were three commonly used indicators of child physical wellbeing at age 9 years old: 1) overall health status 2) overweight, including obesity, and 3) diagnosis of asthma (Moore, Murphey, Bandy, & Lawner, 2014). Overall health status was reported by the mother who was asked about the general health of her child with three coded response categories (0 = *excellent*, 1 = *very good*, 2 = *not optimal – good, fair, poor*). Overweight, including obesity, was based on the Center for Disease Control and Prevention (CDC) BMI-growth-chart guidelines for age and sex using the interviewer measured height (m) and weight (kg), with 1 indicating a BMI ( $\text{kg/m}^2$ ) at or above the 85<sup>th</sup> percentile (Waldfoegel, Craigie, & Brooks-Gunn, 2010). For asthma, the mother reported if her child had ever been diagnosed with asthma by a healthcare professional, with 1 indicating having a diagnosis of asthma.

***Maternal Depression.*** Maternal depression was measured at the 9-year follow-up using the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1994). If mothers reported experiencing either dysphoria or anhedonia on most days for at least two weeks during the past 12-months, she was asked about seven additional symptoms. Those reporting either dysphoria or anhedonia and three additional symptoms were considered depressed. Mothers who reported taking medication for depression were not asked about symptoms, but were coded as having depression (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). Maternal depression was coded as meeting diagnostic criteria (1) or not meeting criteria (0).

***Child health and health behaviors.*** To determine the independent impact of current maternal depression and other risk and protective factors, a dichotomous indicator

of prior poor overall health was included, with 1 indicating the mother reported the child not in optimal health at either the 3-year or 5-year follow-up. Additionally, we included a dichotomous indicator of whether or not the child had had some form of health insurance at the 9-year follow-up.

Five mother-reported child health behaviors from the 9-year follow-up were also included: 1) physical activity, 2) television viewing, 3) fast food consumption, 4) fruit and vegetable consumption, and 5) sleeping pattern (Gladstone et al., 2015; Lang, 2012). Physical activity was measured as the amount of time spent playing outside, with a higher value representing more physical activity (0-16 hours per day). Television viewing was a dichotomous variable, with 1 indicating more than the recommended 2 hours of television watched daily (Strasburger et al., 2013). Fast food consumption per week included three categories, never ate fast food (0), ate fast food once per week (1), or ate fast food two or more times per week (2). Fruits and vegetable consumption per day included three categories, 0-1 serving per day (0), 2-3 servings per day (1), and 4 or more servings per day (2). Sleeping pattern was a dichotomous variable, with 1 indicating the child on average got the minimum recommended hours (e.g. at least 9 hours) of sleep per night (Hirshkowitz et al., 2015).

***Maternal health factors.*** Four indicators of maternal physical health from the 9-year follow-up were included: 1) presence of a serious physical disability, 2) weight status, 3) diagnosis of asthma, and 4) smoking status. Mothers self-reported if they had a serious physical disability that interfered with the ability to work, with 1 indicating the presence of a serious physical disability. Maternal BMI was calculated by dividing weight (kg), which was measured by a trained interviewer at the 9-year follow-up, by

height squared ( $\text{m}^2$ ), which was measured by a trained interviewer at the 3- or 5-year follow-up. However, 9.8% of mothers self-reported their weight. BMI was categorized into three groups: normal (0;  $\text{BMI} < 25 \text{ kg/m}^2$ ), overweight (1;  $\text{BMI} = 25\text{-}29.9 \text{ kg/m}^2$ ), and obese (2;  $\text{BMI} \geq 30 \text{ kg/m}^2$ ). Additionally, a category indicating missing data was included to retain sample size for the multivariate analyses (10.9%). Mothers also self-reported if she had a diagnosis of asthma and how many packs of cigarettes smoked per day, coded as no smoking (0), less than a pack (1), or a pack or more (2)

***Maternal-child relationship.*** We included two mother-reported measures related to the maternal-child relationship at the 9-year follow-up: 1) perceived parenting stress and 2) perceived parenting competence. Parenting stress was measured by summing responses to the 4-item Parent Stress Inventory (Abidin, 1995), related to parenting being harder than expected, feeling trapped by parenting responsibilities, finding parenting to be more work than pleasure, and often feeling exhausted from parenting. Items were rated on a 4-point Likert scale (0 = *strongly disagree* to 3 = *strongly agree*). A higher score (0-12) indicated more perceived parenting stress. The Cronbach's alpha for the study sample was 0.66.

Parenting competence was measured by summing the responses to three items selected by Fragile Families (Bendheim-Thoman Center for Research on Child Wellbeing, 2011) from the Family Functioning section of the National Survey of Child Health (Blumberg et al., 2005). Items were rated on a 4-point scale and included feelings of closeness with child (0 = *not very close* to 3 = *extremely close*), ability to communication with child (0 = *not very well* to 3 = *very well*), and rating of self as a parent (0 = *not very good parent* to 3 = *excellent parent*). A higher score (0-9) indicated

greater parenting competence. Items were combined based on face validity with a Cronbach's alpha of 0.59.

***Sociodemographic characteristics.*** We included twelve sociodemographic variables at the child-, maternal-, and family-level commonly linked to child physical wellbeing and maternal depression (Gladstone et al., 2015; Hardie & Landale, 2013; Lang, 2012; Turney, 2011; 2012). Child-level characteristics collected at baseline included maternal report of the child's sex (0 = *girl*, 1 = *boy*) and if the child had low birthweight (< 2,500 grams). Mothers were also asked if they breastfed, and if reporting she had, were asked for how long. Breastfeeding duration included three categories: never breastfed (0), breastfed for 4 months or less (1), and breastfed for more than 4 months (2).

Baseline maternal-level controls measured included the mother's race/ethnicity (0 = *non-Hispanic white*, 1 = *non-Hispanic black*, 2 = *Hispanic/other*), nativity status (0 = *not-US born*, 1 = *US born*), education level (0 = *less than high school*, 1 = *high school/GED*, 2 = *more than high school*), mother's age (*continuous in years*), whether the mother was a first time mother for the focal child, marital status (0 = *not married to father*, 1 = *married to father*), and mother-report of being in poor or fair general health at baseline. Maternal poor health status at baseline was included as a proxy for postpartum depression (Le Strat, Dubertret, & Le Foll, 2011), as data related to depression at or around the time of the child's birth were not available.

Family-level controls measured at baseline included family income-to-poverty ratio based on annual poverty thresholds established by the US Census Bureau and generated by the Fragile Families study staff (Bendheim-Thoman Center for Research on

Child Wellbeing, 2008) and mother report of material hardship. Family income-to-poverty ratio was categorized into 6 groups: 0-49% of income-to-poverty (0), 50-99% (1), 100-199% (2), 200-299% (3), 300-399% (4), and 400% or more (5). Material hardship was based on seven dichotomous indicators: 1) going hungry because unable to afford food, 2) evicted due to nonpayment, 3) utilities shut off due to nonpayment, 4) housing instability due to financial problems, 5) homelessness, 6) unable to pay for needed medical services, and 7) telephone services disconnected due to nonpayment, with 1 indicating at least 1 past year material hardship. See Table 1.1 for study variable descriptions.

### **Analytical Approach**

All analyses were conducted using Stata 13/SE (StataCorp, 2013). Univariate analyses were conducted to examine each indicator of child physical wellbeing overall and by maternal depression status. Unadjusted regression analyses were conducted to examine the relationships between overall child physical health (ordered logistic) and, separately, childhood overweight and asthma (logistic) with maternal depression, sociodemographic characteristics, child health and health behaviors, maternal health factors, and maternal-child relationship factors. Significant factors ( $p \leq .05$ ) were included in adjusted models using a stepped-approach. Stepped multivariate analyses estimated the relationships between the three indicators of child physical health and maternal depression, adjusting for factors related to sociodemographic characteristics, child health and health behaviors, maternal health factors, and maternal-child relationship factors. Upon adding each variable block to the model, the coefficient for maternal depression was examined for changes to determine the influence of each set of factors.

See Figure 1.1 for conceptual model.

All regression models were assessed for multicollinearity using tolerance and variance inflation factor (VIF), which were all in range. Additionally, Hosmer and Lemeshow (HL) goodness-of-fit tests for each model were non-significant, indicating good model fit. The concordance statistic (c-statistic) estimated for the logistic regression models examining overweight ( $c = .67$ ) and asthma ( $c = .69$ ) indicated a good model fit (Hosmer & Lemeshow, 2000). Lastly, for the ordered logistic regression analyses examining overall health, a Brants test of the parallel regression assumption was non-significant, indicating no violation to the proportional odds assumption (Hosmer & Lemeshow, 2000).

Finally, a Karlson-Holm-Breen (KHB) mediational model (Breen et al., 2013) was conducted for factors found to completely attenuate the risk of maternal depression. KHB mediational modeling decomposes the total effect of a variable into direct and indirect effects of the outcomes, while controlling for the effects of other factors (Breen et al., 2013). Survey weights were not used as there are no appropriate sample weights for data drawn from the in-home interviews (Bendheim-Thoman Center for Research on Child Wellbeing, 2008). However, variables used to generate survey weights (e.g. race, marital status, etc.) were included in the analyses and robust standard errors were estimated per recommendation from the Fragile Families research team (Bendheim-Thoman Center for Research on Child Wellbeing, 2008).

## Results

As illustrated in Table 1.2, the average baseline age for mothers was 25.1 years old ( $SD = 6.0$ ). The majority of mothers were black (48.8%), with 14.3% born outside the

US. Most mothers were unmarried (74.4%) and had a high school education or higher (65.3%), with 60% at or below 199% of the federal income-to-poverty level. Overall, 16.3% of mothers met past year diagnostic criteria for depression at the 9-year follow-up.

Approximately 15% of 9-year-old children were reported as not having optimal health, 41.8% were overweight (including obesity), and 29.9% had a lifetime diagnosis of asthma (Table 1.3). As compared to children not currently experiencing maternal depression, those with a depressed mother had a statistically significantly lower percentage of excellent health (48.6% versus 58.0%) and higher percentage of poor health (20.7% versus 14.1%), overweight (47.2% versus 40.7%), and asthma (33.9% versus 29.1%). Based on unadjusted regression analyses, maternal depression was a risk factor for poor overall health, with the odds of reporting poor versus very good/excellent child health being 50% higher when the mother had depression. In unadjusted regression analyses, maternal depression was also associated with a 30% increased risk of overweight and a 25% increased risk of asthma (Table 1.4).

Adjusted ordered logistic regression analyses using a stepped approach first controlled for sociodemographic characteristics followed by child health and health behaviors, then maternal health factors, and finally the maternal-child relationship. In an adjusted ordered logistic regression, including sociodemographic characteristics attenuated the risk of poor health associated with maternal depression (AOR = 1.38, 95% CI [1.13-1.67]), resulting in a 26% reduction in the odds of poor child health (Table 1.5). Adjusting for child health and health behaviors and maternal health factors further attenuated the odds of poor overall child health associated with maternal depression (AOR = 1.34, 95% CI [1.09-1.63] and AOR = 1.26 95% CI [1.02-1.57], respectively).

Finally, after adjustment for the maternal parenting stress and competence scaled scores, the association between maternal depression and overall health status was no longer significant (AOR = 1.16, 95% CI [0.93-1.45]). Likelihood-ratio tests were performed comparing each model to the previous model. Significant likelihood-ratio tests ( $ps < 0.001$ ) indicate that the addition of each block of variables significantly improved model fit.

In the ordered logistic regression analyses, the coefficient for maternal depression went from statistically significant to non-significant when parenting stress and competence were included, suggesting that these variables attenuate the risk associated with maternal depression. As such a KHB mediational model (Breen et al., 2013) was conducted, which decomposes the total effect of maternal depression into the direct and indirect effects of child overall health status through the maternal-child relationship variables, while controlling for the confounding effects of concomitants (i.e. sociodemographic variables, child health and health behaviors, and maternal health factors). Results (Table 1.6) indicated that maternal parenting stress and competence completely mediated the association between maternal depression and overall child health status, after accounting for all other risk and protective factors from the final model (total effect: OR = 1.27,  $p = 0.028$ ; direct effect: OR = 1.16,  $p = 0.193$ ; indirect effect: OR = 1.10,  $p < 0.001$ ). A greater percent of the mediated effect was associated with maternal competence (61.7%) as compared to parenting stress (38.3%).

However, maternal depression remained a significant risk factor for overweight after controlling for sociodemographic characteristics, child health and health behaviors, maternal health factors, and the maternal-child relationship, resulting in a 37% increased

odds of being overweight for children with a depressed mother. Maternal depression was no longer associated with a lifetime diagnosis of childhood asthma after adjusting for sociodemographic characteristics (AOR = 1.13, 95% CI [0.90-1.41]). Likelihood-ratio tests between each model for overweight and asthma also showed significant improvement in model fit with the addition of the sociodemographic characteristics, child health and health behaviors, and maternal health factors ( $ps < 0.001$ ), but did not show significant model fit improvement for the addition of the maternal-child relationship ( $ps > 0.50$ ).

In the final models (Model 5 for each outcome), there were also a number of individual predictors related to differences in each physical health outcome (Supplemental Tables 1-3). For child overall health, risk factors included poor child health at age 3 or 5 (AOR = 4.39, 95% CI [3.38-5.71]), having health insurance (AOR = 1.83, 95% CI [1.20-2.78]), more than 2 hours of television daily (AOR = 1.31, 95% CI [1.11-1.55]), fast food consumption 2 or more times per week (AOR = 1.25, 95% CI [1.01-1.56]), and higher parenting stress (AOR = 1.03, 95% CI [1.01-1.06]). As such, for a 1-unit increase in parenting stress, the odds of the child having poor overall health increases by 1.03. Protective factors associated with a decreased risk of poor health included more hours spent playing outside (AOR = 0.96, 95% CI [0.93-0.99]), 4 or more servings of fruits and vegetables per week (AOR = 0.69, 95% CI [0.54-0.88]), and higher parenting competence (AOR = 0.81, 95% CI [0.77-0.86]). In other words, for a 1-unit increase in parenting competence, the odds of the child having poor overall health decreases by 0.81.

For child overweight, additional risk factors included having a mother that was

overweight (AOR = 1.91, 95%CI [1.52-2.41]) or obese (AOR = 3.24, 95% CI [2.60-3.95]). Protective factors included having a health insurance (AOR = 0.62, 95% CI [0.43-0.90]). Factors associated with an increased risk of a diagnosis of asthma included poor child health at 3 or 5 years (AOR = 2.59, 95% CI [1.97-3.40]), having health insurance (AOR = 1.56, 95% CI [1.01-2.41]), fast food consumption 1-2 times per week (AOR = 1.25, 95%CI [1.01-1.56]), maternal diagnosis of asthma (AOR = 2.57, 95% CI [2.06-3.21]), and higher parenting competence (AOR = 1.07, 95% CI [1.01-1.15]). No protective factors were associated with child asthma.

### **Discussion**

This study utilized a large community sample of mothers and children with information on a comprehensive list of sociodemographic, child-, maternal-, and family-level factors, including two maternal-child relationship factors. While most 9-year-olds were reported in very good or excellent health, almost 1 in 6 were reported as not having optimal health, nearly half were overweight, and about a third had a lifetime diagnosis of asthma. Approximately 1 in 6 mothers had experienced past 12-month depression, and children of these mothers were more likely to be reported as not being in optimal health and having an increased risk of overweight and asthma. However, the association between maternal depression and these three indicators of child physical health outcomes differed after taking into account additional risk and protective factors.

Maternal depression was associated with an increased risk of poor overall child health after controlling for sociodemographic characteristics, child health and health behaviors, and maternal health, yet was no longer significant after including two factors related to the maternal-child relationship. This suggests that lower parenting stress and

greater parenting competence may attenuate the risk of poor overall child health as a function of maternal depression. A KHB mediational model supported that these two maternal-child relationship factors completely mediated the association between maternal depression and child overall health at age 9. While the importance of the maternal-child relationship for child psychological and emotional wellbeing in the context of maternal depression has been well established (Gladstone et al., 2015; Goodman et al., 2011; Reuben & Shaw, 2015), this factor has rarely been examined for child physical health outcomes. For children, physical health and psychological wellbeing are interconnected, and should garner more equal attention in research and practice.

It is also important to acknowledge that the report of overall child health is based on maternal report and it may be that those who report high levels of parenting stress and low levels of parenting competence may be more likely to report poor child health, regardless of the actual health of the child. Also, mothers with depression may have a distorted perception of her parenting ability and the wellbeing of her child (Gartstein, Bridgett, Dishion, & Kaufman, 2009), suggesting that mothers with depression should be supported in their appraisal of parenting stress and competence as well as their child's health status. Regardless, the maternal perception that her child is in poor health may have consequences for the wellbeing of the child.

Findings also revealed that maternal depression remained a significant risk factor for childhood overweight, even after controlling for multiple risk and protective factors. Our findings, while consistent with a meta-analysis of current literature (Lampard et al., 2014), contribute to this body of research by including a more comprehensive set of risk and protective factors. Our results highlight additional factors influencing overweight,

including fast food consumption and maternal weight status. Given the nature of depression, mothers may be more likely to rely on fast food as opposed to preparing meals for her child and herself, contributing to her own unhealthy weight and that of her child. More research is needed to better understand the pathways through which maternal depression impacts childhood overweight.

Maternal depression was no longer a risk factor for a lifetime diagnosis of asthma after adjustment for sociodemographic characteristics suggesting that these factors attenuated the risk associated with maternal depression. Interestingly, parenting competence was significantly associated with an increased risk of an asthma diagnosis, which may be related to the fact that the indicator of asthma requires a diagnosis from a healthcare professional. As such, greater parenting competence may mean the mother is more likely to bring the child to the doctor. Future research is needed to explore this possible pathway.

Findings also identified modifiable risk and protective factors associated with overall health, overweight, and diagnosis of asthma, which were consistent with existing literature (Gladstone et al., 2015; Hirshkowitz et al., 2015; Lang, 2012). For overall health, more television viewing and fast food consumption were related to poor child health, whereas more time spent playing outside and more fruits and vegetables consumed were related to better overall health. For overweight, maternal overweight and obesity were associated with increased risk of childhood overweight, similar to previous findings (Lang, 2012). For asthma, increased fast food consumption was also a risk factor. These findings suggest that modifiable child health behaviors had a major impact on child health outcomes and should be the focus of intervention and prevention

programs prior to school-age. Additionally, research should focus on how maternal depression may impact child health behaviors, leading to poor health outcomes.

### **Limitations**

There are some limitations to address. First, our factors were not exhaustive, but did represent a range of well-established risk and protective factors influencing physical wellbeing in children (Gladstone et al., 2015; Turney, 2011; 2012). Additional variables that would be important to consider are those related to maternal health behaviors, including levels of physical activity, dietary habits, and sleep patterns, which have been shown to influence her health and the health behaviors of her children (Lampard et al., 2014). Also, the indicator of maternal depression is a dichotomous measure of past 12-month depression and does not take into account onset, severity, or chronicity.

Depression was not measured at baseline, so poor maternal general health was included as a proxy for postpartum depression (Le Strat et al., 2011). Regardless, the CIDI is a highly validated measure of depression (World Health Organization, 1994). While our findings do not suggest a causal relationship, they highlight a significant association between maternal depression and child physical health outcomes. Finally, those excluded from the analytic sample were more advantaged than the full sample of those completing the 9-year follow-up, suggesting that our results may be an underrepresentation of the association between maternal depression and child physical wellbeing.

### **Implications**

Despite limitations, our findings contribute to the literature regarding the impact of maternal depression on child physical wellbeing, particularly by providing a more in-depth understanding of the role of two factors related to the mother-child relationship.

Based on our findings, programs aimed at helping mothers with depression reduce parenting stress and increase competence may mitigate the risk to child physical wellbeing. Additionally, screening for maternal depression during routine child well-visits may lead to early identification and treatment of maternal depression, which may also have an upstream effect on child health outcomes. Currently, the American Academy of Pediatrics recommends screening for maternal depression in child primary care settings during the first year of life (Kerker et al., 2016; Mishina & Takayama, 2009). However, our findings suggest that screening for maternal depression should continue throughout childhood. Furthermore, as additional screenings may lead to increased identification of problems, it is important that child primary care providers have the knowledge and resources to support mother's mental health needs. Finally, future research should focus on exploring the pathways through which maternal depression is associated with child physical wellbeing, including the temporal order between mother's depressive symptoms and child physical health outcomes.

**Table 1.1.** Description of study variables

Question		Wave	Coding
Child Physical Health Outcomes			
General health status	In general, how is your child’s health?	5	2 poor, fair, or good (not optimal health) 1 very good 0 excellent
Weight status	Interviewer measured Body-Mass-Index (BMI)	5	0 not overweight (BMI < 85 <sup>th</sup> percentile) 1 overweight or obese (BMI ≥ 85 <sup>th</sup> percentile)
Diagnosis of asthma	Has a health care professional or doctor ever told you your child has asthma?	5	0 no diagnosis of asthma 1 has been given a diagnosis of asthma
Key predictor			
Maternal depression	Meets CIDI criteria for major depression	5	0 maternal depression not present 1 maternal depression present
Demographics			
Child-level			
Sex	Focal baby’s sex	1	0 female 1 male
Low birthweight	Baby weighed less than 2,500 grams at birth	1	0 did not have low birth weight 1 had low birth weight (< 2,500 gm)
Breastfeeding duration	For how many months was the child breastfed?	2	0 was not breastfed 1 breastfed for less than 4 months 2 breastfeed for 4 months or more
Maternal-level			
Race/ethnicity	Race and ethnicity	1	0 non-Hispanic white 1 non-Hispanic black 2 Hispanic and other
Nativity status	Born in the US	1	0 born outside of the US 1 born in the US
Education	Highest education level	1	0 less than high school 1 high school 2 more than high school
Age	Age at birth (years)	1	Continuous (15-43 years old)

First time mother	Was the focal baby the first child the mother had given birth to?	1	0 focal child was not first baby 1 focal child was the mother's first baby
Marital status	Married to baby's father	1	0 not married to baby's father 1 married to baby's father
Poor health status	Report having not optimal overall health at birth	1	0 optimal overall health 1 did not have optimal overall health
<i>Family-level</i>			
Income to poverty ratio	Constructed poverty category for income-to-poverty ratio	1	0 0-49% income to poverty 1 50-99% income to poverty 2 100-199% income to poverty 3 200-299% income to poverty 4 300-399% income to poverty 5 400% or more income to poverty
Material hardship	Experienced at least one of the following during the past 12 months: 1. Going hungry because unable to pay for food 2. Evicted due to nonpayment 3. Utilities shut off due to nonpayment 4. Housing instability due to financial problems 5. Homelessness 6. Unable to pay for needed medical services 7. Telephone services disconnected due to nonpayment	5	0 did not experience past-12 month a material hardship 1 experienced a past 12 month material hardship
<b>Child health and health behaviors</b>			
Prior poor health	How is your child's general health?	3, 4	0 child in excellent or very good health at ages 3 and 5 1 child not in optimal health at age 3 or 5
Health insurance	Does child have publicly funded or privately funded health insurance?	5	0 child does not have health insurance 1 child has health insurance
Physical activity	Amount of time the child spends playing outside	5	Continuous (0-16 hours)
Television viewing	Amount of time the child spends watching television daily	5	0 less than the recommended 2 hours 1 more than the recommended 2 hours
Fruit and vegetable consumption	Amount of fruits and vegetables consumed daily	5	0 0 to 1 servings daily 1 2-3 servings daily 2 4-5 servings daily

Fast food consumption	Amount of fast food consumed weekly	5	0 none weekly 1 once weekly 2 more than once weekly
Sleeping pattern	Amount of sleep child gets per night	5	0 less than the recommended 9 hours 1 at least 9 hours of sleep per night
<b>Maternal health factors</b>			
Serious health problem	Do you have a serious health problem that limits the work you can do?	5	0 no serious disability 1 has a serious disability
Asthma	Have you ever been told by a doctor or health care professional that you have asthma?	5	0 no diagnosis of asthma 1 has a diagnosis of asthma
BMI	Mother's interview measured BMI	5	0 normal weight (BMI < 25) 1 overweight (BMI = 25-30) 2 obese (BMI > 30) 3 coded to retain missing data
Smoking	Mother's smoking behavior	5	0 does not smoke 1 less than a pack a day 2 a pack or more per day
<b>Mother-child relationship</b>			
Parenting stress	How much do you agree that: 1. Taking care of children is harder 2. Feel trapped by responsibilities 3. Parenting is more work than pleasure 4. Often feel tired, worn out, or exhausted from raising a family	5	0 strongly disagree 1 somewhat disagree 2 somewhat agree 3 strongly agree
Parenting competence	Rating of: 1. Self as a caregiver/parent 2. Closeness felt with your child 3. How well communicate with your child	5	0 not at all good 1 good 2 very good 3 excellent
			Summed score (0-12)
			Summed score (0-9)

Wave: 1= baseline (birth of focal child); 2 = 1-year follow-up; 3 = 3-year follow-up; 4 = 5-year follow-up; 5 = 9-year follow-up

**Table 1.2.** Descriptive statistics of key predictors and covariates by maternal depression

	<b>Total</b>	<b>No depression</b>	<b>Has depression</b>
	<b>N (%) / M(SD)</b>	<b>N (%) / M(SD)</b>	<b>N (%) / M(SD)</b>
<b>Maternal Depression</b>			
No depression	2,481 (83.7)		
Has depression	484 (16.3)	--	--
<b>Sociodemographic characteristics</b>			
Child sex			
Female	1, 417 (47.8)	1,199 (48.3)	218 (45.1)
Male	1,548 (52.2)	1,282 (51.7)	266 (54.9)
Low birthweight			
No	2,703 (91.2)	2,265 (91.3)	438 (90.5)
Yes	262 (8.8)	216 (8.7)	46 (9.5)
Breastfeeding duration			
Did not breastfeed	1,225 (41.3)	1,026 (43.4)	199 (41.1)
Breastfed ≤ 4 months	890 (30.0)	730 (29.4)	106 (33.1)
Breastfed > 4 months	850 (28.7)	725 (29.2)	125 (25.8)
Mother race/ethnicity			
Non-Hispanic White	669 (22.6)	552 (22.2)	117 (24.2)
Non-Hispanic Black	1,446 (48.8)	1,197 (48.3)	249 (51.5)
Hispanic and other	850 (28.7)	732 (29.5)	118 (24.4)
Nativity status			
Foreign born	425 (14.3)	381 (15.4)	44 (9.1)
US born	2,540 (85.7)	2,100 (84.6)	440 (90.9)
Mother education			
Less than high school	913 (30.8)	730 (29.4)	183 (37.8)
High school	934 (31.5)	783 (31.6)	151 (31.2)
More than high school	1,118 (37.7)	968 (39.0)	150 (31.0)
Mother's age (years)	25.12 (6.0)	25.27 (6.1)	24.32 (5.7)
Focal child is mother's first baby			
No	1,794 (60.5)	1,492 (60.2)	302 (62.5)
Yes	1,169 (39.5)	988 (39.8)	181 (37.5)
Mother married			
No	2,206 (74.4)	1,802 (72.6)	404 (83.5)
Yes	759 (25.6)	679 (27.4)	80 (16.5)
Mother poor health status			
No	2,007 (67.7)	1,715 (69.1)	292 (60.3)
Yes	958 (32.3)	766 (30.9)	192 (39.7)
Household income-to-poverty ratio			
0-49%	513 (17.3)	407 (16.4)	106 (21.9)
50-99%	485 (16.4)	395 (15.9)	90 (18.6)
100-199%	778 (26.2)	649 (26.2)	129 (26.7)
200-299%	465 (15.7)	391 (15.8)	74 (15.3)
300%-399%	401 (13.5)	348 (14.0)	53 (10.9)
400% +	323 (10.9)	291 (11.7)	32 (6.6)
Experienced material hardship			
No	1,968 (66.4)	1,772 (71.4)	196 (40.5)
Yes	997 (33.6)	709 (28.6)	288 (59.5)
<b>Child health and health behaviors</b>			

Poor health at age 3 or 5			
No	2,576 (89.2)	2,156 (89.2)	420 (89.0)
Yes	312 (10.8)	260 (10.7)	52 (11.0)
Child has insurance			
No insurance	143 (4.8)	122 (4.9)	21 (4.3)
Public/private insurance	2,817 (95.2)	2,355 (95.1)	462 (95.7)
Average hours played outside	3.88 (2.26)	3.85 (2.25)	4.05 (2.32)
Daily television viewing			
2 hours or less	1,163 (39.3)	1,009 (40.7)	154 (31.9)
More than 2 hours	1,798 (60.7)	1,469 (59.3)	329 (68.1)
Weekly fruit/vegetable consumption			
1 or fewer servings	899 (30.4)	748 (30.2)	151 (31.2)
2 to 3 servings	1,590 (53.7)	1,336 (53.9)	254 (52.5)
4 or more servings	472 (15.9)	393 (15.9)	79 (16.3)
Weekly fast food consumption			
0 times	770 (26.0)	645 (26.0)	125 (25.8)
1 time	1,259 (42.5)	1,059 (42.7)	200 (41.3)
2 or more times	935 (31.5)	776 (31.3)	159 (32.9)
Hours of sleep per night			
Less than 9 hours	1,023 (34.6)	837 (33.8)	186 (38.6)
9 hours or more	1,938 (65.4)	1,642 (66.2)	296 (61.4)
<b>Maternal health factors</b>			
Has serious disability			
No	2,631 (88.7)	2,293 (92.5)	338 (70.1)
Yes	331 (11.3)	187 (7.5)	144 (29.9)
Weight status			
Normal	776 (29.3)	661 (29.7)	115 (27.3)
Overweight	740 (28.0)	636 (29.6)	104 (24.7)
Obese	1,130 (42.7)	928 (41.7)	202 (48.0)
Has diagnosis of asthma			
No	2,466 (84.71)	2,098 (85.8)	368 (79.0)
Yes	445 (15.29)	347 (14.2)	98 (21.0)
Smoking status			
Does not smoke	2,151 (72.62)	1,884 (76.0)	267 (55.3)
Less than 1 pack per day	574 (19.38)	444 (17.9)	130 (26.9)
1 pack or more per day	237 (8.00)	151 (6.1)	86 (17.8)
<b>Maternal-child relationship</b>			
Parenting stress score (continuous, 0-12)	4.09 (2.72)	3.86 (2.62)	5.27 (2.90)
Parenting competence score (continuous, 0-9)	7.20 (1.45)	7.25 (1.44)	6.97 (1.52)

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N = 2,965

Notes. Missing: Poor health at age 3 or 5 (77), Child has insurance (5), Average hours played outside daily (21), Daily television viewing (4), Weekly fruits and vegetable consumption (4), Weekly fast food consumption (1), Hours of sleep per night (4), Maternal serious disability (3), Maternal weight status (319), Maternal diagnosis of asthma (54), Maternal smoking status (3).

**Table 1.3.** Descriptive statistics for child physical health outcomes by maternal depression

	<b>Total</b>	<b>No depression</b>	<b>Has depression</b>	<b><i>p</i>-value <sup>a</sup></b>
	<b>N (%) / M(SD)</b>	<b>N (%) / M(SD)</b>	<b>N (%) / M(SD)</b>	
<b>Overall health status</b>				<.001
Not optimal health	450 (15.2%)	350 (14.1%)	100 (20.7%)	
Very good	841 (28.4%)	692 (27.9%)	149 (30.8%)	
Excellent	1,674 (56.5%)	1,439 (58.0%)	235 (48.6%)	
<b>Overweight (including obesity)</b>				
No	1,587 (58.2%)	1,351 (59.3%)	236 (52.8%)	.011
Yes	1,139 (41.8%)	928 (40.7%)	211 (47.2%)	
<b>Diagnosis of asthma</b>				.037
No	2,078 (70.1%)	1,758 (70.9%)	320 (66.1%)	
Yes	887 (29.9%)	723 (29.1%)	164 (33.9%)	

*Notes.* N = 2,965; Missing: Overweight (239); <sup>a</sup> Overall difference between children with depressed and non-depressed mothers.

**Table 1.4.** Unadjusted odds ratios using robust standard errors for child physical health and maternal depression, sociodemographic characteristics, child health and health behaviors, maternal health, and the maternal-child relationship

	Poor overall health	Overweight	Asthma
	Unadjusted OR (95%CI)	Unadjusted OR (95%CI)	Unadjusted OR (95%CI)
<b>Maternal Depression</b>			
No depression	-	-	-
Has depression	1.50 (1.24-1.80)***	1.30 (1.06-1.60)*	1.25 (1.01-1.53)*
<b>Sociodemographic characteristics</b>			
Child's is male	1.15 (.99-1.32)*	.83 (.71-.96)*	1.48 (1.26-1.73)***
Low birthweight	1.40 (1.10-1.79)**	.75 (.57-.99)*	1.82 (1.40-2.36)***
Breastfeeding duration			
Did not breastfeed	-	-	-
Breastfed ≤ 4 months	.84 (.71-.99)*	.89 (.74-1.07)	.88 (.73-1.06)
Breastfed > 4 months	.88 (.75-1.05)	.76 (.63-.92)**	.84 (.69-1.01)
Mother race/ethnicity			
Non-Hispanic White	-	-	-
Non-Hispanic Black	1.69 (1.41-2.03)***	1.56 (1.27-1.91)***	2.07 (1.67-2.58)***
Hispanic and other	1.56 (1.27-1.90)***	1.72 (1.38-2.14)***	1.46 (1.15-1.85)**
Mother US born	.77 (.63-.94)**	.77 (.62-.96)*	1.79 (1.41-2.32)***
Maternal education			
Less than high school	-	-	-
High school	1.04 (.86-1.24)	1.06 (.88-1.28)	.84 (.69-1.03)
More than high school	.76 (.64-.90)***	.78(.65-.95)**	.85 (.70-1.02)
Mother's age (years)	.99 (.98-1.01)	1.00 (.99-.101)	.98 (.97-.99)**
Focal child is mother's first baby	.95 (.83-1.10)	.92 (.79-1.07)	.90 (.77-1.06)
Mother married	.64 (.54-.75)***	.69 (.57-.82)***	.56 (.46-.68)***
Mother poor health	1.92 (1.66-2.23)***	1.12 (.96-1.32)	1.12 (.95-1.33)
Household income-to-poverty ratio			
0-49%	-	-	-
50-99%	.94 (.74-1.20)	1.24 (.96-1.61)	1.02 (.79-1.33)
100-199%	.93 (.75-1.16)	1.10 (.87-1.38)	.88 (.69-1.12)
200-299%	.87 (.68-1.11)	.94 (.71-1.22)	.74 (.57-.98)*
300%-399%	.65 (.50-.84)***	.95 (.72-1.26)	.67 (.50-.90)**
400% +	.45 (.34-.60)***	.57(.42-.78)***	.57 (.41-.78)***
Experienced material hardship	1.45 (1.25-1.67)***	1.01 (.86-1.18)	1.29 (1.09-1.52)**
<b>Child health and health behaviors</b>			
Poor prior child health	5.22 (4.16-6.56)***	.97 (.76-1.25)	2.49 (1.96-3.15)***
Child has health insurance	1.39 (.97-1.99)	.60 (.42-.86)***	1.57 (1.05-2.36)
Average hours played outside daily	.96 (.93-.99)*	.99 (.96-1.02)	1.00 (.97-1.04)
More than 2 hours daily TV viewing	1.50 (1.30-1.73)***	1.32 (1.13-1.55)***	1.23 (1.04-1.44)*
Weekly fruit/vegetable consumption			
1 or fewer servings	.83 (.71-.97)*	.98 (.82-1.16)	.81 (.68-.97)*

2 to 3 servings	.60 (.48-.75)***	1.03 (.81-1.30)	.92 (.72-1.17)
4 or more servings			
Weekly fast food consumption			
0 times	-	-	-
1 time	1.18 (.99-1.41)	1.38 (1.14-1.67)***	1.25 (1.02-1.53)*
2 or more times	1.37 (1.13-1.65)***	1.31 (1.06-1.60)**	1.23 (.99-1.52)
9 hours of sleep per night	.79 (.68-.92)**	.97 (.83-1.14)	.89 (.75-1.05)
<b>Maternal health factors</b>			
Has a serious physical disability	1.54 (1.24-1.92)***	1.08 (.85-1.38)	1.35 (1.06-1.71)*
Weight status			
Not overweight/obese	-	-	-
Overweight	1.16 (.95-1.41)	2.05 (1.65-2.56)***	1.14 (.91-1.41)
Obese	1.34 (1.12-1.61)***	3.45 (2.81-4.22)***	1.21 (.99-1.47)
Has a diagnosis of asthma	1.28 (1.06-1.55)*	1.17 (.95- 1.44)	2.76 (2.25-3.40)***
Smoking status			
Does not smoke	-	-	-
Less than 1 pack per day	1.08 (.90-1.29)	1.05 (.86-1.27)	1.06 (.87-1.30)
1 pack or more per day	1.24 (.96-1.61)	1.16 (.88-1.54)	1.45 (1.09-1.91)**
<b>Maternal-child relationship</b>			
Parenting stress score	1.08 (1.06-1.11)***	1.01 (.98-1.04)	1.02 (.99-1.05)
Parenting competence score	.78 (.74-.82)***	.99 (.94-1.05)	1.07 (1.01-1.13)*

Notes. N = 2,965; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; OR (Odds Ratio); CI (Confidence Interval).

Ordered logistic regression analysis: Overall health status (2 = *not optimal*, 1 = *very good*, 0 = *excellent*). Logistic regression analysis: Overweight (1 = *overweight, including obesity*); Asthma (1 = *diagnosis of asthma*)

**Table 1.5.** Multivariate regression analyses estimating child physical health as a function of maternal depression, adjusting for sociodemographic characteristics, child health and health behaviors, maternal health factors, and the maternal-child relationship

	<b>Model 1: Bivariate</b>	<b>Model 2: M1+Sociodemographic characteristics <sup>a</sup></b>	<b>Model 3: M2+Child health and health behaviors <sup>a,b</sup></b>	<b>Model 4: M3+Maternal health factors <sup>a,b,c</sup></b>	<b>Model 5: M4+Maternal-child relationship <sup>a,b,c,d</sup></b>
	<b>Unadjusted OR (95%CI)</b>	<b>Adjusted OR (95%CI)</b>	<b>Adjusted OR (95%CI)</b>	<b>Adjusted OR (95%CI)</b>	<b>Adjusted OR (95%CI)</b>
<b>Overall Health</b>					
No depression	-	-	-	-	-
Maternal depression	1.50 (1.24-1.80)***	1.38 (1.13-1.67)**	1.34 (1.09-1.63)**	1.26 (1.02-1.57)*	1.16 (.93-1.45)
<b>Overweight (including obesity)</b>					
No depression	-	-	-	-	-
Maternal depression	1.30 (1.06 -1.60)*	1.37 (1.11-1.69)**	1.38 (1.10-1.71)**	1.38 (1.09-1.76)**	1.37 (1.07-1.75)*
<b>Diagnosis of Asthma</b>					
No depression	-	-	-	-	-
Maternal depression	1.25 (1.01-1.53)*	1.13 (.90-1.41)	1.16 (.92-1.46)	1.07 (.83-1.38)	1.09 (.85-1.41)

Notes. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; OR (Odds Ratio); CI (Confidence Interval).

Ordered logistic regression: Overall health status (2 = *not optimal*, 1 = *very good*, 0 = *excellent*)

Logistic regression: Overweight (1 = *overweight or obesity*); Asthma (1 = *lifetime diagnosis of asthma*)

Reference group: No maternal depression at 9-year follow up

<sup>a</sup> Adjusted for: sociodemographic characteristics (child's sex, low birth weight, breastfeeding duration, mother race, nativity status, mother education, mother age, focal child is mother's first baby mother marital status, mother poor health at birth, household income-to-poverty ratio, past year material hardship)

<sup>b</sup> Adjusted for: child health and health behaviors (poor child health at age 3 or 5, child has health insurance, average hours of outside play daily, daily television viewing, daily fruit and vegetable consumption, weekly fast food consumption, hours of sleep per night)

<sup>c</sup> Adjusted for: maternal health factors (mother has serious disability, mother BMI, mother diagnosis of asthma, smoking status)

<sup>d</sup> Adjusted for: maternal-child relationship (perceived parenting stress scaled score, perceived parenting competence scaled score)

**Table 1.6.** Parental Stress and Competence as Mediators for the Effect of Maternal Depression on Overall Child Health Status using KHB Mediation Modeling

Effect	OR	SE	<i>p</i>	95% CI
Total	1.27	.141	.028	1.03–1.58
Direct	1.16	.129	.193	0.93–1.44
Indirect	1.10	.028	.000	1.05–1.16

*Notes.* OR (Odds Ratio); SE (Standard Error); *p* (Significance level); CI (Confidence Interval)

**Supplemental Table 1.1.** Ordered logistic regression estimating overall child health status as a function of maternal depression, adjusting for sociodemographic controls, child health and health behaviors, maternal health factors, and the maternal-child relationship with robust standard errors

	<b>M2: Sociodemographic characteristics</b>	<b>M3: M2+Child health and health behaviors</b>	<b>M4: M3+Maternal health factors</b>	<b>M5: M4+ Maternal- child relationship</b>
	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>
<b>Maternal depression</b>	1.38 (1.13-1.67)**	1.34 (1.09-1.63)**	1.26 (1.02-1.57)*	1.16 (.93-1.45)
<b>Child health and health behaviors</b>				
Poor health at age 3 or 5		4.52 (3.50-5.84)***	4.51 (3.47-5.86)***	4.39 (3.38-5.71)***
Child has health insurance		1.75 (1.17-2.62)**	1.75 (1.16-2.62)**	1.83 (1.20-2.78)**
Average hours played outside daily		.97 (.93-.99)*	.96 (.93-.99)*	.96 (.93-.99)*
More than 2 hours television daily		1.36 (1.15-1.59)***	1.34 (1.13-1.58)***	1.31 (1.11-1.55)***
Weekly fruit/vegetable consumption				
1 or fewer servings		--	--	--
2 to 3 servings		.90 (.76-1.07)	.93 (.78-1.10)	.94 (.79-1.12)
4 or more servings		.66 (.52-.84)**	.68 (.53-.87)**	.69 (.54-.88)**
Weekly fast food consumption				
0 times		--	--	--
1 time		1.08 (.90-1.31)	1.11 (.92-1.35)	1.08 (.89-1.32)
2 or more times		1.25 (1.02-1.54)*	1.29 (1.05-1.60)*	1.25 (1.01-1.56)*
9 hours or more of sleep per night		.94 (.80-1.11)	.95 (.80-1.12)	.99 (.83-1.17)
<b>Maternal health factors</b>				
Mother has serious disability			1.23 (.92-1.64)	1.24 (.93-1.65)
Weight status				
Not overweight/obese			--	--
Overweight			.98 (.79-1.21)	.97 (.78-1.20)
Obese			1.12 (.92-1.36)	1.12 (.92-1.36)
Diagnosis of asthma			1.10 (.89-1.36)	1.17 (.95-1.44)
Smoking status				

Doesn't smoke			--	--
Less than 1 pack per day			.97 (.78-1.19)	.98 (.80-1.21)
1 pack or more per day			1.12 (.81-1.54)	1.10 (.79-1.51)
<b>Maternal-child relationship</b>				
Parenting stress score				1.03 (1.01-1.06)*
Parenting competence score				.81 (.77-.86)***
<i>N</i>	2,965	2,851	2,791	2,791
Wald $\chi^2$	152.77***	323.68***	321.53***	383.10***
Pseudo- $R^2$	0.028	0.065	0.066	0.080

Notes. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; OR (Odds Ratio); CI (Confidence Interval). Overall health status: 2 = *not optimal*, 1 = *very good*, 0 = *excellent*. All models include sociodemographic characteristics variables from Table 1.2.

**Supplemental Table 1.2.** Logistic regression estimating child overweight as a function of maternal depression, adjusting for sociodemographic controls, child health and health behaviors, maternal health factors, and the maternal-child relationship with robust standard errors

	<b>M2: Sociodemographic characteristics <sup>a</sup></b>	<b>M3: M2+Child health and health behaviors</b>	<b>M4: M3+Maternal health factors</b>	<b>M5: M4+ Maternal-child relationship</b>
	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>
<b>Maternal depression</b>	1.37 (1.11-1.69)**	1.38 (1.10-1.71)**	1.38 (1.09-1.76)**	1.37 (1.07-1.75)*
<b>Child health and health behaviors</b>				
Poor health at age 3 or 5		.87 (.67-1.12)	.82 (.62-1.07)	.82 (.62-1.07)
Child has health insurance		.64 (.44-.92)*	.63 (.43-.92)*	.62 (.43-.90)*
Average hours played outside daily		.99 (.96-1.03)	.99 (.95-1.03)	.99 (.95-1.03)
More than 2 hours television daily		1.18 (1.0-1.41)	1.13 (.95-1.36)	1.14 (.95-1.36)
Weekly fruit/vegetable consumption				
1 or fewer servings		--	--	--
2 to 3 servings		1.02 (.85-1.23)	1.02 (.84-1.23)	1.02 (.84-1.23)
4 or more servings		1.13 (.88-1.45)	1.08 (.83-1.40)	1.07 (.83-1.39)
Weekly fast food consumption				
0 times		--	--	--
1 time		1.23 (1.01-1.50)*	1.20 (.97-1.48)	1.21 (.98-1.50)
2 or more times		1.24 (1.00-1.55)*	1.21 (.96 -1.53)	1.23 (.98-1.55)
9 hours or more of sleep per night		1.07 (.90-1.27)	1.12 (.94-1.35)	1.12 (.94-1.34)
<b>Maternal health factors</b>				
Mother has serious disability			1.02 (.76-1.38)	.98 (.73-1.31)
Weight status				
Not overweight/obese			--	--
Overweight			1.91 (1.52-2.42)***	1.91 (1.52-2.41)***
Obese			3.23 (2.60-4.01)***	3.24 (2.60-3.95)***
Diagnosis of asthma			1.18 (.94-1.49)	1.18 (.93-1.48)
Smoking status				
Doesn't smoke			--	--

Less than 1 pack per day			1.06 (.84-1.32)	1.05 (.84-1.31)
1 pack or more per day			1.23 (.89-1.71)	1.22 (.88-1.69)
<b>Maternal-child relationship</b>				
Parenting stress score				1.01 (.98-1.04)
Parenting competence score				1.02 (.96-1.08)
<i>N</i>	2,726	2,621	2,568	2,568
Wald $\chi^2$	77.54***	97.71***	213.68***	212.49***
Pseudo- $R^2$	0.022	0.029	0.067	0.067

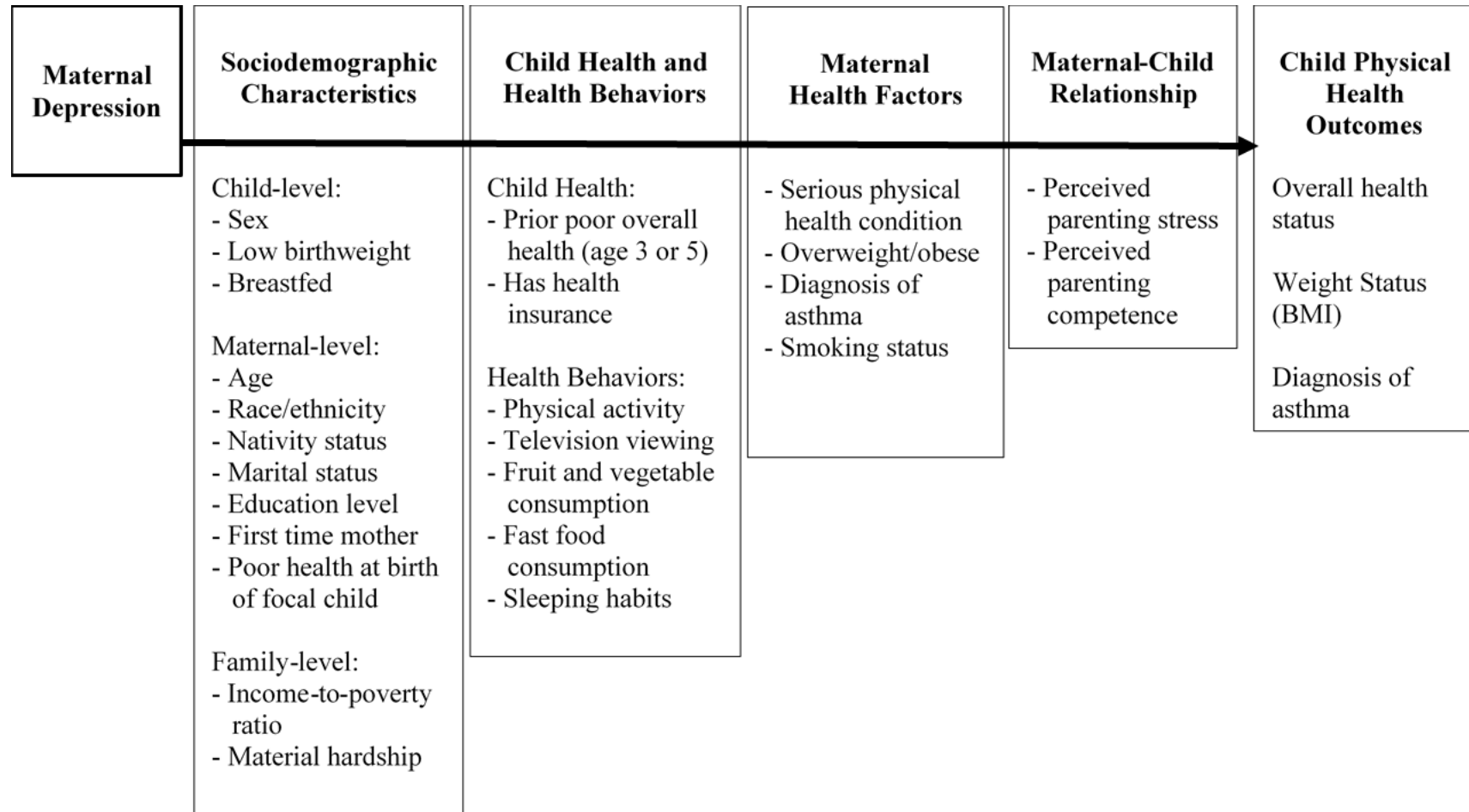
\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; OR (Odds Ratio); CI (Confidence Interval). All models include sociodemographic characteristics variables from Table 1.2.

**Supplemental Table 1.3.** Logistic regression estimating child asthma as a function of maternal depression, adjusting for sociodemographic controls, child health and health behaviors, maternal health factors, and the maternal-child relationship with robust standard errors

	<b>M1: Sociodemographic characteristics <sup>a</sup></b>	<b>M2: M1+Child health and health behaviors</b>	<b>M3: M2+Maternal health factors</b>	<b>M4: M3+ Maternal-child relationship</b>
	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>	<b>AOR (95%CI)</b>
<b>Maternal depression</b>	1.13 (.90-1.41)	1.16 (.92-1.46)	1.07 (.83-1.38)	1.09 (.85-1.41)
<b>Child health and health behaviors</b>				
Poor health at age 3 or 5		2.68 (2.06-3.49)***	2.56 (1.95-3.37)***	2.59 (1.97-3.40)***
Child has health insurance		1.56 (1.03-3.49)*	1.59 (1.04-2.45)*	1.56 (1.01-2.41)*
Average hours played outside daily		.99 (.95-1.03)	.99 (.95-1.03)	.99 (.95-1.03)
More than 2 hours television daily		1.06 (.88-1.26)	1.01 (.84-1.22)	1.02 (.85-1.23)
Weekly fruit/vegetable consumption				
1 or fewer servings		--	--	--
2 to 3 servings		.86 (.72-1.04)	.86 (.71-1.05)	.85 (.70-1.04)
4 or more servings		.92 (.71-1.19)	.93 (.71-1.21)	.91 (.70-1.18)
Weekly fast food consumption				
0 times		--	--	--
1 time		1.14 (.92-1.41)	1.22 (.98-1.52)	1.25 (1.01-1.56)*
2 or more times		1.01 (.80-1.27)	1.05 (.82-1.33)	1.07 (.85-1.37)
9 hours or more of sleep per night		1.07 (.89-1.29)	1.11 (.91-1.34)	1.09 (.90-1.31)
<b>Maternal health factors</b>				
Mother has serious disability			1.04 (.77-1.42)	1.04 (.77-1.42)
Weight status				
Not overweight/obese			--	--
Overweight			1.08 (.84-1.37)	1.08 (.85-1.37)
Obese			1.05 (.84-1.31)	1.04 (.84-1.31)
Diagnosis of asthma			2.61 (2.09-3.26)***	2.57 (2.06-3.21)***
Smoking status				

Doesn't smoke			--	--
Less than 1 pack per day			.90 (.71-1.14)	.89 (.70-1.13)
1 pack or more per day			1.36 (.97-1.90)	1.37 (.98-1.91)
<b>Maternal-child relationship</b>				
Parenting stress score				1.00 (.97-1.04)
Parenting competence score				1.07 (1.01-1.15)*
<i>N</i>	2,965	2,851	2,793	2,793
Wald $\chi^2$	129.26***	180.77***	246.88***	247.42***
Pseudo- $R^2$	0.038	0.057	0.081	0.082

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ ; OR (Odds Ratio); CI (Confidence Interval). All models include sociodemographic characteristics variables from Table 1.2.

**Figure 1.1.** Conceptual model for Paper 1

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### **Chapter III. Latent Profiles of Child Health and Wellbeing in the Context of Maternal Depression**

Childhood is a critical developmental period that forms the foundation for physical and psychosocial health outcomes in adolescence and adulthood. Many of the physical and behavioral conditions leading to poor health among US adults, such as obesity and chronic respiratory disease, have roots in early childhood experiences and, the potential to be prevented if detected and treated early (Center on the Developing Child, 2010; Hawkins et al., 2015; Rosenbaum & Blum, 2015). Indicators of child health and wellbeing can be used to identify risk and protective factors impacting developmental trajectories and outcomes, thereby increasing accountability and informing early intervention and prevention programs (Moore, Murphey, & Bandy, 2012). As such, child health and wellbeing represents an important human resource necessary for successful development across the life course (Center on the Developing Child, 2010; Shonkoff, Boyce, & McEwen, 2009).

Health and wellbeing is a multidimensional construct consisting of various indicators related to individual functioning that can be monitored over time to indicate progress or decline (Center on the Developing Child, 2010; Hillemeier, Lanza, Landale, & Oropesa, 2013; Moore et al., 2012). Broadly, child health and wellbeing often consists of indicators of physical health and psychosocial outcomes (Moore et al., 2012; Moore, Murphey, Bandy, & Lawner, 2014; Rosenbaum & Blum, 2015; US Department of Health and Human Services, 2015). Common physical health indicators include overall health status, weight status, and the presence of chronic health conditions (Moore et al., 2014; US Department of Health and Human Services, 2015). Indicators of child psychosocial

wellbeing include the presence of internalizing (e.g. depression) and externalizing (e.g. behavior problems) disorders, as well as the presence of prosocial behaviors (e.g. perseverance and expressiveness) (Moore et al., 2014; US Department of Health and Human Services, 2014). Importantly, physical health and psychosocial wellbeing are interconnected, representing a multidimensional construct that cannot be accurately captured using only a few indicators (Hillemeier et al., 2013; Moore et al., 2012).

Additionally, wellbeing is more than just the absence of disease and disorder and should also include the presence of positive health indicators (Moore et al., 2012; Moore et al., 2014; Reuben & Shaw, 2015). For instance, a child that does not have an internalizing or externalizing disorder would not be seen as thriving if that same child had no friends and only low levels of prosocial behaviors. Reducing health and wellbeing to a small number of indicators or focusing only on negative indicators may be misleading (Moore et al., 2014); thus, misrepresenting the holistic nature of health and wellbeing. In doing so, children may be mischaracterized as either being at risk or thriving overall, despite a much more nuanced experience of health and wellbeing.

### **Threats to Child Health and Wellbeing**

Given the lifelong influence of health and wellbeing in childhood, it is important to understand the factors that may have a negative impact. Maternal depression is a significant mental health concern that a mother may experience that can influence child health and wellbeing (Danese & McEwen, 2012; Felitti, 2009; Gladstone, Beardslee, & Diehl, 2015; Goodman et al., 2011; Turney, 2011a; Wang, Wu, Anderson, & Florence, 2011). Depression is a psychiatric disorder characterized by dysphoria and/or anhedonia and other somatic, psychological, and behavioral symptoms that occur on most days for

at least two weeks (American Psychiatric Association, 2013). Maternal depression is the broad term used to describe depression occurring among women with children, whereas postpartum depression is specifically related to depression with symptom onset that occurs during the last month of gestation or within six months after delivery (American Psychiatric Association, 2013). In a given year, an average of 1 in 10 mothers suffer from a major depressive disorder, with elevated rates (up to 20%) during the postpartum period (Ertel, Rich-Edwards, & Koenen, 2011; Pratt & Brody, 2014). Importantly, even after the postpartum period, annual rates of maternal depression remain consistent, affecting around 10-11% of mothers and over 7 million children in a given year (England & Sim, 2009; Ertel et al., 2011). It is essential to note that the majority of women who become mothers have more than one child (Monte & Ellis, 2014). Consequently, the number of children exposed to maternal depression may be slightly underestimated, as maternal depression with a second child will undoubtedly affect the first child as well. Whether during the postpartum period or later in childhood, maternal depression has the potential to disrupt the developmental trajectories and outcomes of all children in the household.

### **Maternal Depression as a Risk Factor**

Maternal depression has been characterized as an adverse childhood experience that may have immediate and long-term consequences for both physical health and psychosocial wellbeing (Danese & McEwen, 2012; Felitti, 2009; Gilbert et al., 2015; Gladstone et al., 2015). Maternal depression has been identified as a risk factor for poor outcomes in childhood, including social problems, medical difficulties, and mental health concerns (England & Sim, 2009; Gladstone et al., 2015; Goodman et al., 2011; Luoma et al., 2001). Research has found that infants and toddlers of depressed mothers showed

lower rates of secure attachments and more withdrawn behaviors and negative affect (England & Sim, 2009; Gladstone et al., 2015). School-aged children were more likely to have lower rates of social competence if mothers were depressed currently or during the postpartum period as compared to children of non-depressed mothers (Luoma et al., 2001). A meta-analysis of 193 studies published between 1982 and 2009 found that children of depressed mothers had significantly higher rates of psychopathology, problem behaviors, and internalizing and externalizing disorders as compared to children of non-depressed mothers (Goodman et al., 2011). Additionally, maternal depression was associated with increased physical health problems, like frequent headaches, stomachaches, asthma, poor weight status, and overall poorer health in children (England & Sim, 2009; Gladstone et al., 2015; Lampard et al., 2014; Turney, 2011b; 2012a). In sum, maternal depression poses a particular risk for poor psychosocial wellbeing and physical health outcomes across childhood. However, it must be noted that there is a great deal of heterogeneity in how that risk may impact child health and wellbeing (Gladstone et al., 2015; Lampard et al., 2014; Reuben & Shaw, 2015; Reupert & Maybery, 2007; Reupert, Drost, Nicholson, & van Doesum, 2014).

### **Theoretical Framework**

From a resilience perspective, individuals exposed to risk, like maternal depression, may adapt and develop differently given the presence of other risk and protective factors (Liebenberg & Ungar, 2009; Masten, Powell, & Luthar, 2003; Masten, 2001; 2013; Zolkoski & Bullock, 2012). Those individuals experiencing adversity who develop negative outcomes are considered to be at risk, whereas those who avoid negative outcomes or achieve positive outcomes are considered to be displaying resilient

functioning (Liebenberg & Ungar, 2009; Masten, 2001; 2013). Importantly, resilience scholars caution against using the term resilience as a global or overall description of an individual. Instead, it is important to recognize that individuals may have differential outcomes across and within domains of health and wellbeing (Liebenberg & Ungar, 2009; Masten, 2001; 2013; Reuben & Shaw, 2015). For example, a child that has elevated rates of internalizing symptoms may also have exemplar physical health and high levels of prosocial behaviors. Suggesting that a child fitting that description is at risk and not resilient overstates the impact of the internalizing symptoms and masks the potential mitigating influence of the positive physical health and prosocial behaviors. Conversely, a child with no physical health or psychosocial problems that also lacks the presence of prosocial behaviors may be at risk as well.

A resilience perspective suggests that there is heterogeneity in how individuals adapt in the context of adverse experiences, like maternal depression (Masten, 2013; Reuben & Shaw, 2015). To that end, it is important to consider the heterogeneity in outcomes of health and wellbeing of children experiencing maternal depression. While rates of poor physical health and psychosocial wellbeing are higher among children of depressed mothers as compared to those of non-depressed mothers, it is important to note that the vast majority of children exposed to maternal depression may not experience negative mental and/or physical health outcomes (Gladstone et al., 2015; Goodman et al., 2011; Reuben & Shaw, 2015). The current literature has made important gains towards understanding differences in health among children experiencing maternal depression, but now must shift focus to the ways in which children do well despite risk.

## Study Purpose and Aims

Taken together, these findings suggest that while maternal depression confers risk, there may also be a great deal of heterogeneity in how children experience it. However, the vast majority of empirical literature examining the impact of maternal depression on child wellbeing have typically used a variable-centered deficit-approach that focuses only on a few indicators of either physical or psychosocial wellbeing in early childhood (Gladstone et al., 2015; Goodman et al., 2011; Reuben & Shaw, 2015). Studies examining maternal depression have focused primarily on depression occurring during infancy to early childhood (0-5 years old), with a secondary focus on how experiencing depression during that time impacts outcomes later in childhood, adolescence, and into adulthood (Gladstone et al., 2015; Goodman et al., 2011). Few studies have examined how maternal depression occurring after age 5 may affect children's short- and long-term health and wellbeing (Luoma et al., 2001; Turney, 2011a; 2011b; 2012a), despite the fact that at this age approximately 10-11% of mothers are depressed (Ertel et al., 2011). Additionally, child health and wellbeing is a multidimensional construct including both physical and psychosocial indicators that are related, but represent distinct domains (Hillemeier et al., 2013; Moore et al., 2012). The majority of studies focus on only a single indicator or domain of health and wellbeing, and often view resilience as the absence of negative outcomes, and not the presence of positive ones (Reuben & Shaw, 2015; Reupert & Maybery, 2007). Doing so may fail to fully explore the nuances of child health and wellbeing in the context of maternal depression.

Additionally, current analytic techniques examining the impact of maternal depression on child outcomes often utilize a variable-centered rather than person-centered

approach (Hillemeier et al., 2013). Simply put, variable-centered approaches examine how variables are associated with each other, whereas person-centered approaches explore how variables form patterns across individuals (Laursen & Hoff, 2006). Variable-centered approaches (e.g. regression analyses) are used to identify important predictors and to estimate the strength of those predictors to explain the variability in or probability of a particular outcome (Laursen & Hoff, 2006). Often multiple predictors may be estimated simultaneously to determine which accounts for more variance or predicts a greater probability of the outcome, and is valuable in providing information on the patterns that connect variables. However, this approach assumes that the outcomes of the population studied are homogenous, parameter estimates are similar across aggregate and individual level analyses, and that variables are drivers of change, not individuals (Laursen & Hoff, 2006). Conversely, a person-centered approach assumes homogenous subgroups characterized by unique developmental processes within a heterogeneous population that differ meaningfully on a set of indicators in which the individual is the driver and recipient of change (Lanza, & Rhoades, 2013; Laursen & Hoff, 2006).

Latent class or profile analysis, a person-centered approach, has the overarching goal of classifying individuals into latent subgroups known as classes or profiles (Collins & Lanza, 2013; Lanza & Rhoades, 2013). Latent profile analysis is a relatively new approach that has played an increasingly important role in social science research on child development (Lanza & Cooper, 2016). Given the complexity of child health and wellbeing, a person-centered approach offers an alternative to standard variable-centered approaches to explore this construct (Hillemeier et al., 2013; Lanza & Cooper, 2016). Using latent profile analysis to identify classes of child physical health and psychosocial

wellbeing has the potential to identify heterogeneity in outcomes for children. In doing so, these analyses extended the existing literature by developing a more nuanced examination of child health and wellbeing in the context of maternal depression.

Thus, the aim of this paper was to first, develop and describe a multidimensional conceptualization of child health and wellbeing at age 9 using both positive and negative physical health and psychosocial wellbeing indicators; and second, compare latent profiles based on experiences of maternal depression for children between the ages 5 and 9 years old.

### **Methods**

This study utilized data from the Fragile Families and Child Wellbeing (FFCWB) study, a longitudinal birth cohort study of 4,898 children born in 75 hospitals in 20 US cities between 1998 and 2000 to mainly single mothers (Reichman, Teitler, Garfinkel, McLanahan, 2001; Waldfogel, Craigie, Brooks-Gunn, 2010). Biological mothers were interviewed at or around the time of the focal child's birth (baseline), with follow-up interviews conducted when the child was 1-, 3-, 5-, and 9-years old (Bendheim-Thoman Center for Research on Child Wellbeing, 2008; Bendheim-Thoman Center for Research on Child Wellbeing, 2011). Interviews included core telephone interviews with mothers and in-home face-to-face interviews. At the 9-year follow-up, both the mother and focal child were interviewed separately, with 3,263 observations where both mother and child were interviewed (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). The FFCWB study included questions related to child physical health and psychosocial wellbeing, maternal health indicators, economic and employment status, parenting behaviors, social support and neighborhood cohesion, and other sociodemographic

characteristics (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

The current study sample includes 3,211 observations based on mother and child reports. Observations were excluded if the child had a serious physical disability (e.g. Cerebral Palsy, Down's Syndrome,  $n = 109$ ), did not live with the mother at least half time at age 9 ( $n = 208$ ), or both mother and child were not interviewed at the 9-year follow-up ( $n = 1,269$ ). Cases may satisfy more than one of these criteria. Of note, latent profile analysis uses full information maximum likelihood with robust standard errors to account for missing data, so observations were not excluded from the initial latent profile analysis due to missing data unless all indicators of physical health and psychosocial wellbeing were missing.

The average baseline age for mothers was 25.2 ( $SD = 6.0$ ). The majority of mothers were non-Hispanic black (49.3%), born in the US (85.1%), and were unmarried to the baby's father (75.8%). Most mothers had at least a high school education (68.8%) and 61.5% were at or below 199% of the federal income-to-poverty level. Maternal depression remained consistent around 16% at the 5-year and 9-year follow-ups. Moving from the 5-year to 9-year follow-up, 74.2% had no maternal depression, 9.5% had their depression remit, 9.1% had an onset of depression, and 7.2% were depressed at both time points. Those with both mother and child completing the 9-year follow-up were more likely to have higher education ( $\chi^2 = 10.75, p = 0.005$ ) and be married to the focal child's biological father ( $\chi^2 = 10.22, p = 0.001$ ) at baseline as compared to those not completing the 9-year follow-up. However, there were no differences by child's gender ( $p = 0.931$ ), birth weight ( $p = 0.415$ ), mother's race/ethnicity ( $p = 0.687$ ), mother's nativity status ( $p = 0.113$ ), mother's age ( $p = 0.134$ ) or income-to-poverty ratio ( $p = 0.062$ ).

## Measures

***Child physical health and psychosocial wellbeing.*** Physical health indicators included weight status (i.e. body mass index), the presence of frequent health problems (e.g. asthma, diabetes, frequent headaches), and overall health status reported by mother and child. Weight status was based on the Center for Disease Control and Prevention (CDC) BMI-growth-chart guidelines for age-and-sex using interviewer measured height (m) and weight (kg). BMI ( $\text{kg/m}^2$ ) that was calculated by the Fragile Families study staff (Waldfogel et al., 2010). Children with a BMI at or above the 85<sup>th</sup> percentile based on age-and-sex specific cut-offs were categorized as overweight (including obesity). Mothers reported the presence of 6 possible health problems occurring in the past 12-months including frequent diarrhea or colitis ( $n = 25$ ), anemia ( $n = 36$ ), frequent headaches or migraines ( $n = 232$ ), chronic ear infections (three or more in past year;  $n = 75$ ), doctor diagnosed diabetes ( $n = 5$ ), or doctor diagnosed asthma ( $n = 748$ ). These items represent commonly used indicators of child health problems (Moore et al., 2012; Moore et al., 2014; US Department of Health and Human Services, 2015). Child health problems were coded as a dichotomous variable with 1 indicating the child had at least 1 of the 6 aforementioned health condition and 0 indicating no health problems. Finally, mothers were asked what was the general health of her child and children were asked in general how was their health, using a 5 point Likert-scale (1 = *excellent* to 5 = *poor*). Responses were then recoded into either having optimal health (e.g. excellent, very good) or not optimal health (good, fair, poor) separately for mother and child report.

Indicators of psychosocial wellbeing included the mean score for the internalizing and externalizing disorders subscales using the mother-reported (MR) Child Behavior

Checklist (CBCL) (Achenbach & Rescorla, 2001) and child-reported (CR) Self-Description Questionnaire (SDQ) (Marsh, 1990). The CBCL (Achenbach & Rescorla, 2001) MR internalizing subscale contains 32 items related to being withdrawn, anxious, and having somatic complaints, using a 3-point Likert-Scale (0 = *not true* to 2 = *very/often true*), with a higher score indicating greater internalizing symptoms. The CBCL (Achenbach & Rescorla, 2001) MR externalizing subscale contains 35 items related to rule breaking behavior and aggressive behaviors using a 3-point Likert-Scale (0 = *not true* to 2 = *very/often true*), with a higher mean score indicating greater externalizing symptoms. The Cronbach's alpha for the internalizing and externalizing scales for the current study sample were 0.84 and 0.89, respectively. For research purposes, raw mean scores are recommended over T scores, in order to account for a full range of variation in the scaled scores (Achenbach & Rescorla, 2001). The SDQ (Marsh, 1990) is a child reported 14-item measure that asks the child to rate the frequency of emotions and behaviors (0 = *not at all true* to 3 = *very true*) that were then used to generate mean scores for the internalizing (8-items) and externalizing (6-items) subscales. Mean scores were generated for each subscale, with a higher score indicating greater internalizing and externalizing problems. The Cronbach's alpha for the internalizing and externalizing scales for the current study sample were 0.76 and 0.78, respectively.

Additionally, two indicators of prosocial behaviors were also included. Mother report of prosocial behaviors was measured using a mean score of the 13-item expressiveness subscale of the Adaptive Social Behavior Inventory (ASBI) (Hogan et al., 1992). Items (e.g. "Child is sympathetic towards others' distress" and "Child is self-

confident in social situations”) were rated on a 3-point Likert scale (0 = *not true* to 2 = *very/often true*). A higher mean scale score indicates greater positive expressive behaviors. The Cronbach’s alpha for the expressiveness scale for the current study sample was 0.91. Child reported prosocial behaviors were measured using a scale related to persistent problem solving. The persistent problem solving scale included 5 items modeled after the perseverance scale from the Panel Study of Income Dynamics-Child Development Supplement (PSID-CDS-III). Items (e.g. “I stay with a task until I solve it” and “I try to do my best on all my work”) were rated using a 4-point Likert scale (0 = *never* to 3 = *always*), with a higher score indicating greater perseverance (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). The Cronbach’s alpha for the perseverance scale for the current study sample was 0.59. All child health and wellbeing indicators were from the 9-year follow-up interview.

***Maternal Depression.*** Past 12-month depression diagnosis for mothers at each time point except for baseline was assessed using the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) (World Health Organization, 1994). Mothers were identified as having a past 12-month major depressive disorder if she endorsed either dysphoria or anhedonia on most days for at least two weeks and at least 3 additional symptoms (e.g. weight loss, suicidal thoughts, etc.). Mothers reporting taking medications for depression at the 5-year (n = 3) or 9-year (n = 10) follow-ups were not asked about symptoms, but were coded as having a depressive disorder (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). Additionally, based on indication of depression at the 5-year and 9-year follow-up, a variable of depression chronicity was created including four categories: no depression at the 5- or 9-year follow-

up, depressed at the 5-year follow-up and not at the 9-year follow-up (depression remits), depressed at the 9-year follow-up and not at the 5-year follow-up (depression onset), and depressed at both 5- and 9-year follow-ups (chronic depression).

***Covariates.*** We also included eight sociodemographic characteristics linked with child health and wellbeing and maternal depression (Gladstone et al., 2015; Hardie & Landale, 2013; Lang, 2012; Turney, 2012a; Wang et al., 2011). Child-level characteristics included mother-reported child sex (male, female) and low birthweight status (< 2,500 grams at birth). Maternal-level factors included mother's race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic/other), nativity status (not US born, US born), education level (less than high school, high school/GED, more than high school), mother's age (continuous in years), and marital status (married to focal child's father, not married to father). Finally, family-level covariates included baseline family income-to-poverty ratio based on the annual poverty thresholds established by the US Census Bureau (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). Survey weights were not used. Instead, the variables used to generate survey weights (e.g. race, marital status) were included in the multivariate analyses and robust standard errors were estimated to account for sampling procedures per the recommendation of the Fragile Families documentation (Bendheim-Thoman Center for Research on Child Wellbeing, 2008). See Table 2.1 for description of study variables.

### **Analytic Approach**

Analyses were conducted in three stages. First, univariate descriptive analyses were conducted for all key variables to identify any notable outliers or violations to normality. Bivariate analyses were conducted between current maternal depression and

each indicator of child physical health and psychosocial wellbeing. Chi-square analyses were conducted to examine the relationship between current maternal depression and overweight, child health problems, and overall health status. Independent t-tests were conducted to examine the relationships between current maternal depression and both internalizing, both externalizing, and two prosocial social scale scores. Finally, bivariate analyses were conducted to examine the relationships between health and wellbeing indicators.

Second, a latent profile analysis (LPA) was conducted to identify and describe subgroups of child health and wellbeing based on multiple indicators of physical health and psychosocial wellbeing. LPA is used to identify unobserved heterogeneity and classify individuals into their most likely latent class based on a set of indicators (Lanza & Cooper, 2016). This method offers a more nuanced approach to illustrating complex multidimensional constructs, like child health and wellbeing, by identifying heterogeneity among individuals based on a set of characteristics and behaviors (Abner, 2014; Hillemeier et al., 2013). LPA is a person-centered approach similar to factor modeling, with the exception that factor modeling assumes a continuous latent factor and LPA produces the latent structure as a discrete factor representing mutually exclusive latent classes (Abner, 2014; Lanza et al., 2007; Lanza & Cooper, 2016; Laursen & Hoff, 2006). LPA is a form of latent class mixture modeling that includes both categorical and continuous indicators (Lanza & Cooper, 2016; Magidson & Vermunt, 2004). LPA generates mutually exclusive subgroups (i.e. latent classes or profiles) of individuals with a similar pattern of responses to a set of observed categorical or continuous indicators (Lanza & Cooper, 2016). LPA produces two key pieces of information: 1) membership

probabilities (i.e. estimated proportion of individuals within a specific class) denoted with Greek letter gamma ( $\gamma$ ) and 2) item response probabilities (i.e. probability representing likeliness a class member will endorse an indicator) denoted with Greek letter Rho ( $\rho$ ) (Collins & Lanza, 2013; Lanza & Cooper, 2016).

LPA was used to identify and describe classes of child physical health and psychosocial wellbeing for children at the 9-year follow-up. A total of 10 indicators related to child physical health and psychosocial wellbeing from both mother and child report were used to determine latent profile membership. Physical health indicators included: 1) overweight status (i.e. BMI  $\geq$  85<sup>th</sup> percentile); 2) the presence of at least one physical health problem, and 3) overall health status reported by mother and by child, separately. Psychosocial wellbeing indicators included: 1) presence of internalizing disorder from both mother and child report; 2) presence of externalizing disorder from both mother and child report; 3) prosocial behaviors reported by mother report (e.g. expressiveness) and child report (e.g. perseverance). All indicators for the LPA model were assessed using data from the 9-year follow-up using full information maximum likelihood (FIML) with robust standard error to account for missing data.

Multiple LPA models with a varying number of classes specified were estimated. Comparative model fit statistics were used to determine the number of classes that produce the best fitting model. Comparative model fit indices included the Akaike information criterion (AIC), Bayesian information criterion (BIC), and adjusted Bayesian information criterion (ABIC), with a smaller number suggesting better model fit. Additionally, Lo-Mendell-Rubin likelihood ratio (LMR) and Bootstrap likelihood ratio (BLR) tests were examined, with a significant result indicating a model with an

additional class has better fit. Finally, the entropy value indicates the degree of accuracy in allocating individuals into their latent profile and the predictive accuracy of those profiles, with a value closer to 1 indicating better relative fit (Collins & Lanza, 2013). Model selection for LPA is based on theoretical interpretation, comparative and relative model fit indices, and model parsimony (Collins & Lanza, 2013). After determining the number of classes that produced the best fitting model, item response probabilities were used to describe the profiles based on the 10 indicators. Based on the item response probabilities, profiles were named to reflect the pattern of response to the indicators (Collins & Lanza, 2013; Lanza & Cooper, 2016).

For the final step, the classes that emerged as a result of the latent profile analysis were imported directly into Stata 13 for subsequent analyses. Bivariate analyses were conducted to determine if classes of child health and wellbeing differed by 5-year maternal depression, 9-year maternal depression, and changes in maternal depression between ages 5 and 9 years old. Subsequently, multinomial logistic regression analyses were conducted to determine if experiences of maternal depression and changes in maternal depression predicted profile membership controlling for covariates. Preliminary descriptive and bivariate statistics for all key study variables and multivariate analyses were conducted using Stata 13/SE (StataCorp, 2013) and latent profile analyses were conducted in MPlus 7.4 (Muthén & Muthén, 2012). See Figure 2.1 for conceptual model.

## **Results**

Bivariate analyses were conducted to explore the relationship between key indicators and maternal depression. Chi-square tests were conducted to compare the difference between mother and child reported overall health status, weight status, and

health problems for depressed and non-depressed mothers (Table 2.2). Children of depressed mothers were more likely to overweight ( $\chi^2 = 4.56, p = 0.033$ ), have a health problem ( $\chi^2 = 12.23, p < 0.001$ ), and have MR-reported not optimal health ( $\chi^2 = 11.68, p = 0.001$ ), as compared to children of non-depressed mothers. There was no difference in CR overall health status based on current maternal depression ( $p = 0.310$ ). Children of currently depressed mothers had significantly higher MR internalizing scale score ( $t = -11.50, p < 0.001$ ), MR externalizing scale score ( $t = -10.59, p < 0.001$ ), CR internalizing scale score ( $t = -4.44, p < 0.001$ ), and CR externalizing scale score ( $t = -4.11, p < 0.001$ ) as compared to children of non-depressed mothers. Additionally, children of mothers with depression at the 9-year follow-up had lower expressiveness scale scores ( $t = 3.14, p = .002$ ) as compared to children of non-depressed mothers. There was not a statistically significant difference in perseverance scale scores between children of depressed mothers as compared to non-depressed mothers ( $p = .055$ ).

Additionally, pairwise correlations were conducted to examine the relationship between indicators of physical health and psychosocial wellbeing (Table 2.3). Statistically significant correlations ranged from low ( $r = .043, p = .028$ ) to moderate ( $r = .586, p < .001$ ) and were in the expected direction. As predicted, indicators of physical health and psychosocial wellbeing were moderately correlated with each other suggesting that these indicators may represent an overall latent construct.

### **Latent profile analysis**

In order to identify latent subgroups of children's health and wellbeing, latent profile analyses were performed. LPA was used to classify children into their most likely latent class and provide information regarding the characteristics based on 10 commonly

used indicators of physical health and psychosocial wellbeing at the 9-year follow-up. Multiple LPA models with varying number of latent classes were estimated (up to 10 classes). Table 2.4 compares the goodness of fit statistics for 1-class through 6-class models. The 5-class model was selected based on the comparative and relative fit indices, interpretability of the class characteristics, and parsimony (Lanza & Rhoades, 2013).

The Akaike information criterion (AIC), Bayesian information criterion (BIC), and sample size adjusted Bayesian information criterion (ABIC) were used as comparative fit indices, with a smaller number suggesting better model fit. A 5-class model showed a decrease in all comparative fit indices, suggesting better model fit. Additionally, entropy was used as a measure of relative fit, with a value closer to 1 reflecting the degree of accuracy in classifying individuals in latent profiles and better predictive accuracy of the latent profiles (Lanza & Cooper, 2016; Nylund, Asparouhov, & Muthén, 2007). Interestingly, a 2-class solution (healthy versus not healthy) had the highest entropy (0.889), but relatively limited interpretability and poor comparative fit. Besides the 2-class solution, the 5-class solution offered the highest entropy (0.819) with lower AIC, BIC, and ABIC. An entropy value greater than .800 is considered acceptable (Muthén & Muthén, 2005). Finally, the Lo-Mendell Rubin likelihood ratio (LMR-LR) test was not significant for the 5-class model, suggesting that the 5-class model did not offer model fit improvement from the 4-class. However, the bootstrap LR test was statistically significant, indicating that the 5-class model fit better than a 4-class model. The bootstrap LR test is a parametric method that estimates the difference distribution of the log likelihood difference and is preferred over the LMR-LR test for LPA (Morgan, 2015; Nylund, Asparouhov, & Muthén, 2007). Importantly, determining model fit for

LPA requires a balance between all fit indices, interpretability, and parsimony (Lanza & Cooper, 2016). Taking each element into account, a 5-class model was selected as the best fitting model. Fit indices are reported in Table 2.4 and Figure 2.2.

The 5-class model of child health and wellbeing at the 9-year follow-up was characterized as: 1) *Thriving* ( $n = 1,953$ ; 60.8%), 2) *Mother-child (M-C) discrepant* ( $n = 715$ ; 22.3%), 3) *Thriving physical – At-risk psychosocial* ( $n = 139$ ; 4.3%), 4) *At-risk physical – Struggling psychosocial* ( $n = 331$ ; 10.3%), and 5) *At-risk* ( $n = 73$ ; 2.3%). The results of the LPA are described below and are summarized in Table 2.5 and graphically in Figure 2.3.

The *Thriving* profile, the largest of the five classes, was characterized by low probabilities of being overweight ( $\rho = 0.38, p < 0.001$ ) and having health problems ( $\rho = 0.25, p < 0.001$ ), with high probabilities of being in MR optimal health ( $\rho = 0.89, p < 0.001$ ), and CR optimal health ( $\rho = 0.79, p < 0.01$ ). The *Thriving* profile also had the lowest mean scores for MR internalizing ( $M = 0.10, p < 0.001$ ), MR externalizing ( $M = 0.10, p < 0.001$ ), CR internalizing ( $M = 0.85, p < 0.001$ ), and CR externalizing ( $M = 0.51, p < 0.001$ ), coupled with higher mean scores for expressiveness ( $M = 1.54, p < 0.001$ ) and perseverance ( $M = 2.53, p < 0.001$ ). The average latent class membership probability for profile 1 was  $\gamma = 0.903$ , suggesting a high degree of accuracy in assigning individuals to this latent profile.

The *MC discrepant* profile was the second largest of the five classes and was characterized by slightly elevated probabilities of being overweight ( $\rho = 0.44, p < 0.001$ ) and having health problems ( $\rho = 0.36, p < 0.001$ ), with high probability of being in MR optimal health ( $\rho = 0.85, p < 0.001$ ), but a lower probability of CR optimal health ( $\rho =$

0.61,  $p < 0.001$ ). The *MC discrepant* profile also had lower mean scores for MR internalizing ( $M = 0.11$ ,  $p < 0.001$ ) and externalizing ( $M = 0.16$ ,  $p < 0.001$ ), yet higher means scores for CR internalizing ( $M = 1.74$ ,  $p < 0.001$ ) and externalizing ( $M = 1.71$ ,  $p < 0.001$ ), coupled with average mean scores for MR expressiveness ( $M = 1.45$ ,  $p < 0.001$ ) and lower mean score for CR perseverance ( $M = 2.22$ ,  $p < 0.001$ ). The average latent class membership probability for profile 2 was  $\gamma = 0.862$ , suggesting a high degree of accuracy in assigning individuals to this latent class.

Two latent classes were identified as having inconsistent health and wellbeing. The *Thriving physical-At-risk psychosocial* profile (4.3%) was characterized by having lower probabilities of being overweight ( $\rho = 0.39$ ,  $p < 0.001$ ) and having health problems ( $\rho = 0.30$ ,  $p < 0.001$ ), with moderate probability of being in MR optimal health ( $\rho = 0.76$ ,  $p < 0.001$ ) and CR optimal health ( $\rho = 0.69$ ,  $p < 0.001$ ). However, this profile also had higher mean scores for MR internalizing ( $M = 0.38$ ,  $p < 0.001$ ), MR externalizing ( $M = 0.30$ ,  $p < 0.001$ ), CR internalizing ( $M = 1.09$ ,  $p < 0.001$ ) and CR externalizing ( $M = 0.79$ ,  $p < 0.001$ ), as well as lower scores for expressiveness ( $M = 1.32$ ,  $p < 0.001$ ) and perseverance ( $M = 2.13$ ,  $p < 0.001$ ). The average latent class membership probability ( $\gamma = 0.865$ ) for profile 3 was also high.

The *At-risk physical-Struggling psychosocial* profile (10.3%) was characterized by having higher probabilities of being overweight ( $\rho = 0.50$ ,  $p < 0.001$ ) and having health problems ( $\rho = 0.48$ ,  $p < 0.001$ ), with slightly lower probability of being in MR optimal health ( $\rho = 0.70$ ,  $p < 0.001$ ) and CR optimal health ( $\rho = 0.70$ ,  $p < 0.001$ ). This profile also had elevated rates of MR internalizing ( $M = 0.38$ ,  $p < 0.001$ ), MR externalizing ( $M = 0.30$ ,  $p < 0.001$ ), CR internalizing ( $M = 1.10$ ,  $p < 0.001$ ), and CR

externalizing ( $M = 0.79, p < .001$ ). However, this subgroup also had higher mean scores for expressiveness ( $M = 1.30, p < 0.001$ ) and perseverance ( $M = 2.41, p < 0.001$ ). The average latent class membership probability ( $\gamma = 0.827$ ) for class 4 also suggested a higher degree of accuracy in assigning individuals to this latent profile.

Finally, the *At-risk* (2.3%) profile was the smallest and characterized by having higher probabilities of being overweight ( $\rho = 0.58, p < 0.001$ ), having health problems ( $\rho = 0.45, p < 0.001$ ), and lower probabilities of being in MR optimal health ( $\rho = 0.60, p < 0.001$ ) and CR optimal health ( $\rho = 0.59, p < 0.001$ ). This subgroup also had higher mean scores for MR internalizing ( $M = 0.72, p < 0.001$ ), MR externalizing ( $M = 0.67, p < 0.001$ ), CR internalizing ( $M = 1.64, p < 0.001$ ) and CR externalizing ( $M = 1.51, p < 0.001$ ), and lower mean scores for expressiveness ( $M = 1.08, p < 0.001$ ) and perseverance ( $M = 2.15, p < .001$ ). The average latent class membership probability ( $\gamma = 0.919$ ) for class 5 was also high.

### **Bivariate Analyses and Multinomial Logistic Regression Analyses**

Bivariate analyses and multinomial logistic regressions were conducted to examine the associations between maternal depression (for children aged 5 and 9 years old, and for changes in depression between those ages) and profiles of child health and wellbeing (Table 2.6). Overall, the majority of children were in the *Thriving* group, with higher rates among children experiencing no maternal depression. Children experiencing current (9-year) or past (5-year) maternal depression were more likely to be in either the *Thriving physical-At-risk* psychosocial, *At-risk physical- Struggling psychosocial*, or *At-risk* as compared to children of non-depressed mothers. However, children of non-depressed mothers were more likely to be in the *MC discrepant* group.

For the multinomial logistic regression analyses, the *Thriving* profile was used as the reference group, and controlled for child sex, low birth weight, maternal age, maternal race/ethnicity, maternal nativity status, maternal education, marital status, and family poverty-to-income ratio. Table 2.7 shows the relative risk ratios (RRR) and 95% confidence intervals (CI) of being in the *MC discrepant*, *Thriving physical-At-risk psychosocial*, *At-risk physical-Struggling psychosocial*, or *At-risk* group as compared to the *Thriving* group controlling for covariates.

Maternal depression at the 5-year follow up was significantly associated with an increased risk of being in the *Thriving physical-At-risk psychosocial* (Relative Risk Ratio [RRR] = 2.06, 95% CI [1.36-3.12]), *At-risk physical-Struggling psychosocial* (RRR = 1.61, 95% CI [1.18-2.20]), and the *At-risk* (RRR = 4.34, 95% CI [2.65-7.12]) profiles as compared to the *Thriving* group controlling for covariates. Similarly, maternal depression at the 9-year follow-up was also associated with an increased risk of being in the *Thriving physical-At-risk psychosocial* (RRR = 2.53, 95% CI [1.69-3.80]), *At-risk physical-Struggling psychosocial* (RRR = 2.96, 95% CI [2.22-3.94]), and the *At-risk* (RRR = 5.07, 95% CI [3.10-8.31]) groups as compared to the *Thriving* group controlling for covariates. Maternal depression at the 5- and 9-year follow-ups was not associated with being in the *MC discrepant* group. Additionally, the relative risk of being in the *At-risk* group increased based between the changes in maternal depression group, with the high risk among children experiencing maternal depression at both time points (RRR = 8.59, 95% CI [4.52-16.31]).

Finally, to evaluate how significantly maternal depression affects child health and wellbeing, posterior predictive probabilities of each latent profile by maternal depressive

status were examined (Table 2.8) (Williams, 2012). The posterior predictive probability highlighted that the majority of children were in the *Thriving* profile regardless of maternal depression, yet children of depressed mothers were less likely to be predicted in this group. Conversely, children of currently or past depressed mothers had a higher predicted probability of being in the *At-risk group* as compared to children of non-depressed mothers (5.6% versus 1.4% for both 5- and 9-year maternal depression). Additionally, the predicted probability of being in the *At-risk* group increased based on changes in maternal depression, with 1.1% for no depression, 4% when depression remits, 4% with depression onset, and 8% for chronic depression. Notably, children of non-depressed mothers had a higher predicted probability of being in the *MC discrepant* group at both the 5-year and 9-year follow-ups as compared to children of depressed mothers (21.4% versus 18.6% and 21.8% versus 19.8%, respectively).

### Discussion

The current study found five distinct profiles of child health and wellbeing, suggesting that using the traditional dichotomy of children being classified as “healthy” versus “unhealthy” may not fully explain the heterogeneity in this multifaceted construct. In these analyses, the *Thriving* and *At-Risk* profiles, representing this “healthy” versus “unhealthy” distinction, were accompanied by three additional profiles of varying health and wellbeing. These results suggest that children may experience both negative and positive health outcomes simultaneously. Findings are also comparable with previous research suggesting that maternal depression is linked to an increased risk of poor child health and wellbeing (England & Sim, 2009; Gladstone et al., 2015; Goodman et al., 2011; Lampard et al., 2014; Luoma et al., 2001; Turney, 2011b). However, these findings

add to the empirical literature by identifying differential types of risk profiles characterized by having both strengths and deficits in either the physical and/or psychosocial domains.

We identified five profiles of child health and wellbeing in these analyses. The *Thriving* group was the largest (60.8%) and characterized by having low levels of physical and psychological health problems, and high levels of optimal health and prosocial behaviors. Children allocated to this profile show positive health and wellbeing across domains and indicators. Conversely, the *At-risk* group was the smallest group (2.3%) and had high levels of physical and psychosocial problems, with lower levels of optimal health and prosocial behaviors. Children identified in the *At-risk* profiles are currently experiencing negative health and wellbeing across multiple indicators that put them at risk for poorer health in adolescence and adulthood. Importantly, these two profiles were accompanied by three additional profiles of varying health and wellbeing.

The *MC discrepant* profile (22.3%) was characterized by discordant responses between mother and child related to the child's health and wellbeing. In this group, mothers were more likely to report her child had optimal health and few psychosocial problems, which was starkly contrasted by the child reporting much lower levels of being in optimal health and higher levels of internalizing and externalizing symptoms. Physical health (e.g. BMI and presence of health problems) was not remarkably different from the *Thriving* group. However, what makes this profile unique is the seemingly complete lack of agreement in optimal health status and psychosocial wellbeing between mother and child. If children are reporting high levels of problems that are not recognized by the mother, then the chances of getting treatment are greatly diminished. As such, children in

this profile may be at risk for subsequent problems. This profile highlights the need for both mother and child reports of health and wellbeing, as focusing solely on mother report may miss important information.

The third largest profile was the *At-risk physical-Struggling psychosocial* group (10.3%). This group was characterized by lower levels of optimal health and higher levels of poor physical health, specifically having a higher probability of being overweight and other health problems, coupled with moderately high level of psychological problems. However, this group is distinct in that despite these problems, this profile was also characterized by high levels of prosocial behaviors. In particular, the child reported perseverance scale score was only slightly lower than that in the *Thriving* group. Of note, perseverance is related to the construct of grit, which is the ability to pursue one's goals despite obstacles (Duckworth, Peterson, Matthews, & Kelly, 2007; Kern, Benson, Steinberg, & Steinberg, 2016). Grit is a trait often associated with resilient functioning that has been implicated in the ability to do well despite risk (Liebenberg & Ungar, 2009; Masten, 2001; Masten, 2013). As such, while this group has high levels of physical and psychological problems, the presence of prosocial behaviors represents a strength that may be capitalized on in clinical practice. Finally, failing to include a measure of prosocial behaviors would have resulted in these children being labeled at-risk, highlighting the benefit of including both positive and negative indicators of health and wellbeing.

Finally, the *Thriving physical-At-risk psychosocial* group (4.3%) was characterized by having moderately high levels of reported optimal health and low levels of physical health problems, but higher psychological problems and lower prosocial

behaviors. More specifically, children in this group had a lower probability of being overweight or having frequent health problems, with rates comparable to the *Thriving* group. However, this group had elevated rates of both mother and child reported internalizing and externalizing symptoms. Of note, both mother and child report higher levels of externalizing symptoms as compared to internalizing symptoms. This profile supports the need for psychological screenings and assessment in a primary care setting. While the children in this group are currently doing well physically, they are at risk for subsequent health problems due to their elevated rates of internalizing and externalizing symptoms. Early identification of these symptoms is key in curbing future negative consequences (England & Sim, 2009). Taken together, these findings illustrate and support previous research as to the importance of using multiple positive and negative indicators of both physical and psychosocial health to describe child health and wellbeing (Moore et al., 2014; Reuben & Shaw, 2015).

When examining profiles of child health and wellbeing based on maternal depression, we found that children with depressed mothers at ages 5 and 9 years old were most likely to be in the *Thriving* group (52.1% and 46%, respectively). In total, the predicted probability of being in the *Thriving* group ranged from 48.9% to 66.1%. Consistent with previous literature, these findings suggest that while maternal depression confers risk, the majority of children experiencing it are actually doing well (Reuben & Shaw, 2015; Reupert et al., 2014). However, children of depressed mothers had a lower predicted probability of being in the *Thriving* profile than children of non-depressed mothers.

To that point, we also found that children experiencing maternal depression at age

5 and age 9 had significantly higher relative risks of being in the *At-risk* group (4.34 times higher and 5.07 times higher, respectively). Additionally, children experiencing maternal depression onset at year 9 had a 4.64 times higher relative risk of being in the *At-risk* group and those experiencing depression at both time points had the highest rates of being in the *At-risk* group. While the predicted probability of being in the *At-risk* group was lower for all children (1.1%-8.0%), we see elevated rates for children of depressed mothers. As such, these findings suggest a continued need for screening and treatment of maternal depression later in childhood. The American Academy of Pediatrics recommends screening for maternal depression at well-child visits during the first year of life (Kerker et al., 2016; Mishina & Takayama, 2009). Many screenings within pediatric care settings take only a few minutes (Kerker et al., 2016), and could lead to higher rates of diagnosis and treatment for mothers experiencing depression, thereby lessening the impact on child health and wellbeing (Coiro, 2015; Kerker et al., 2016). Early identification of maternal depression may lead to increased chances of treatment, thereby preventing negative health outcomes for both mother and child (England & Sim, 2009).

Additionally, maternal depression at the 5-year and 9-year follow-ups were also significantly associated with an increased risk of being in the *Thriving physical-At-risk psychosocial* (RRR = 2.09 and 2.53, respectively) and *At-risk physical-Struggling psychosocial* (RRR = 1.61 and 2.96, respectively) groups. Similarly, depression onset and chronic depression were also associated with increased risks of being in the *Thriving physical-At-risk psychosocial* (RRR = 2.08 and 3.45, respectively) and *At-risk physical-Struggling psychosocial* (RRR = 3.31 and 2.67, respectively). These findings are consistent with previous literature that maternal depression has an impact on both

physical and psychological problems (Gladstone et al., 2015; Goodman et al., 2011; Lampard et al., 2014; Turney, 2011b; Turney, 2012a). Furthermore, the predicted probability of being in the *At-risk physical-Struggling psychosocial* was significantly higher for children of depressed mothers. As described, this profile is characterized by high levels of internalizing and externalizing problems, but also high levels of prosocial behaviors, suggesting the potential for these children to do well if provided clinical interventions building off their strengths. Similarly, children with depressed mothers had higher predicted probability of being in the *Thriving physical-At-risk psychosocial* profile, which demonstrates resilient functioning in the physical domain.

Finally, maternal depression was not associated with the *MC discrepant* group. Instead, children of non-depressed mothers had a higher predicted probability of being in this latent profile. These novel findings may suggest that a mother having experienced depression is more clinically aware of or may be more likely to accurately report psychological symptoms in her child. Mothers not experiencing depression may be less attuned to the psychological wellbeing of their child, unaware of symptoms, or their child may be less likely to discuss these symptoms with their mother. As these findings are novel, any explanation is purely speculative and warrants additional analyses to explore the possible reasons behind them. Regardless, this profile highlights the need for both mother and child report when examining child health and wellbeing both clinically and in research. Furthermore, it would be important to include father's report of child health and wellbeing and to examine outcomes across different domains, such as in the school context.

## **Limitations**

Despite its strengths, the current study had some important limitations to address. First, the indicator of maternal depression was based on a validated standardized measure (World Health Organization, 1994), but was represented as a dichotomy of diagnosis or no diagnosis. It does not take in to account subclinical levels of maternal depression or symptom chronicity or severity. However, it does take into account diagnostic chronicity, which is a strength. Furthermore, these analyses did not include a measure of postpartum depression, which was not available in the Fragile Families public dataset, but focused on depression later in childhood, which is a gap in current research. Additionally, there was a four-year break between follow-up time points in which depression symptoms and child outcomes were not accounted. Second, as the analyses used secondary data, there were limitations related to variable availability. In particular, the majority of measures related to child health and wellbeing were about negative health outcomes, with few focusing on the presence of positive health indicators. Subsequent analyses would benefit from more diverse indicators of positive health outcomes, such as health promoting behaviors, physical fitness, emotional regulation, and self-efficacy (Moore et al., 2012; Moore et al., 2014). Third, while covariates were used in the multivariate multinomial logistic regression, there may be additional factors influencing child health and wellbeing that were not included in the model, including genetic similarities between mother and child, which may play a role in child health and wellbeing.

## **Implications**

Despite limitations, this study provides important information regarding heterogeneity in child health and wellbeing in the context of maternal depression. There

is a wealth of literature that supports the negative impact that maternal depression has on child health outcomes (Gladstone et al., 2015; Goodman et al., 2011; Reupert & Maybery, 2007; Reupert et al., 2014). However, most of this literature utilizes a variable-centered approach focused on deficits in single domains of child health and wellbeing attributed to experiences of maternal depression in early childhood. These variable-centered approaches offer important insights into identifying risk factors, but may not account for possible heterogeneity in outcomes. As such, the current study makes an important contribution to the literature by examining child health and wellbeing using a person-centered approach that includes both positive and negative indicators of health and wellbeing occurring later in childhood. Theoretically, children exposed to risk factors like maternal depression have the potential to do well despite risk, yet this process has been rarely examined empirically (Gladstone et al., 2015; Reuben & Shaw, 2015; Reupert et al., 2014).

This study also provides an important direction for future analyses. For example, future studies should examine whether complementary profiles emerge in other large datasets of child health and wellbeing. More specifically, research should examine how profiles change when including additional positive health indicators, like those aforementioned. Furthermore, analyses including mother, father, and child report may provide additional information regarding nuances of child health and wellbeing. Finally, future analyses should examine the mechanisms that support children with multiple risk factors being allocated into the *Thriving* profile. Doing so would provide important information on the protective factors that support resilient functioning in children experiencing multiple risk factors.

In conclusion, these findings have important implications for practice and policy for children experiencing maternal depression. These results suggest that when examining child health and wellbeing in clinical practice, clinicians should include multiple indicators of health and wellbeing across domains. Additionally, clinical assessments should go beyond just identifying the presence of negative outcomes to include the presence of positive ones. Recognizing these different health and wellbeing profiles gives social workers and clinical practitioners the opportunity to identify strengths in children experiencing risk, and to use them to develop clinically-tailored programs that capitalize on client assets. These findings also highlight the importance of using multiple informants when collecting information on child health and wellbeing. Given that maternal depression remained a significant risk factor later in childhood, policy should support continued screening in primary care settings and also provide ongoing treatment for mothers experiencing depression after the postpartum period. Finally, these findings suggest that children experiencing maternal depression have varied health and wellbeing, that often includes the potential to do well despite associated risk.

**Table 2.1.** Description of key study variables

<b>Variables for latent classes of child wellbeing</b>				
<b>Construct</b>	<b>Item</b>	<b>Respondent</b>	<b>Wave</b>	<b>Coding</b>
Weight status (overweight)	Age-and-sex Body Mass Index (BMI)	Interviewer measured	5	0 not overweight (BMI < 85 <sup>th</sup> percentile) 1 overweight or obese (BMI ≥ 85 <sup>th</sup> percentile)
Health problems	In the past 12 months, has child had any of the following health problems?			
	- Frequent diarrhea/colitis, anemia, frequent headaches/migraines, three or more ear infections, diabetes, asthma	Mother	5	0 no diagnosis of health problems 1 at least one frequent health problems
Overall health status	In general, how is your child's health?	Mother	5	0 not optimal (good, fair, poor) 1 optimal (excellent, very good)
Overall health status	In general, how is your health?	Child		
Internalizing problems	CBCL – Internalizing scale	Mother	5	Mean scale score (0-2)
	SDQ – Internalizing scale	Child	5	Mean scale score (0-3)
Externalizing problems	CBCL – Externalizing scale	Mother	5	Mean scale score (0-2)
	SDQ – Externalizing scale	Child	5	Mean scale score (0-3)
Prosocial behaviors	ASBI – Expressiveness	Mother	5	Mean scale score (0-2)
	PSID-CDS-III – Perseverance	Child	5	Mean scale score (0-3)
<b>Key predictor</b>				
Maternal depression	Diagnosis of depression	Mother	4, 5	0 did not meet criteria for depression 1 met for past 12-month depression
	Change in depression	Mother	4, 5	0 did not meet for depression at wave 4 or 5 1 met for depression at wave 4, not 5 2 met for depression at wave 5, not 4 3 met for depression at both wave 4 and 5

**Table 2.2.** Descriptive statistics for key study variables by maternal depression

	Total	No 9-year depression	9-year depression	<i>p</i> <sup>a</sup>
	N (%) / M(SD)	N (%) / M(SD)	N (%) / M(SD)	
<b>Indicators of physical health</b>				
Weight status				
Overweight/obese	1215 (41.3)	992 (40.4)	218 (45.7)	.033
Not overweight/obese	1727 (58.7)	1461 (59.6)	259 (54.3)	
Child physical health problems				
At least 1 health problem	986 (30.7)	789 (29.5)	193 (37.2)	<.001
No physical health problems	2224 (69.3)	1890 (70.6)	326 (62.8)	
MR Overall health status				
Optimal	2718 (84.7)	2295 (85.7)	414 (79.8)	.001
Not optimal	492 (15.3)	384 (14.3)	105 (20.2)	
CR Overall health status				
Optimal	2156 (72.8)	1806 (73.2)	341 (70.9)	.310
Not optimal	806 (27.2)	663 (26.9)	140 (29.1)	
<b>Indicators of psychosocial wellbeing</b>				
MR internalizing scale score	0.16 (0.16)	0.14 (0.15)	0.23 (0.19)	<.001
MR externalizing scale score	0.17 (0.18)	0.16 (0.16)	0.25 (0.22)	<.001
CR internalizing scale score	1.14 (0.70)	1.12 (0.69)	1.27 (0.70)	<.001
CR externalizing scale score	0.91 (0.72)	0.88 (0.71)	1.03 (0.74)	<.001
Expressiveness scale score	1.47 (0.44)	1.48 (0.44)	1.41 (0.43)	.002
Perseverance scale score	2.42 (0.48)	2.42 (0.48)	2.39 (0.49)	.055
<b>5-year Maternal Depression</b>				
No depression	2514 (83.3%)	-	-	-
Has depression	505 (16.7%)			
<b>9-year Maternal Depression</b>				
No depression	2,679 (83.7%)	-	-	-
Has depression	520 (16.3%)			
<b>Change in Maternal Depression</b>				
No depression	2232 (74.2%)			
Depression remits	286 (9.5%)			
Depression onset	273 (9.1%)	-	-	-
Depression both years	216 (7.2%)			

Notes. N = 3,211. MR = Mother-reported; CR = Child-reported. Missing: Weight status (269), Health problems (1), MR overall health status (1), CR overall health status (249), MR internalizing (228), MR externalizing (228), CR internalizing (226), CR externalizing (221), Expressiveness (229), Perseverance (218), 5-year depression (192), 9-year depression (12), Change in maternal depression (204).

<sup>a</sup> Overall difference between year 9 maternal depression and no depression (chi-square for categorical, ttest for continuous indicators)

**Table 2.3.** Correlations between indicators of child health and wellbeing

	1	2	3	4	5	6	7	8	9	10
1. Overweight	-									
2. Health problems	.056**	-								
3. MR Overall health	-.088***	-.225***	-							
4. CR Overall health	-.107***	-.044*	.107***	-						
5. MR Internalizing	.083***	.125***	-.190***	-.086***	-					
6. MR Externalizing	.043*	.086***	-.124***	-.067***	.586***	-				
7. CR Internalizing	.024	.042*	-.046*	-.103***	.113***	.185***	-			
8. CR Externalizing	.028	.085***	-.059**	-.158***	.121***	.312***	.548***	-		
9. Expressiveness	-.052**	-.027	.163***	.066*	-.229***	-.163***	-.091***	-.073***	-	
10. Perseverance	-.009	-.040*	.018	.151***	-.103***	-.163***	-.158***	-.340***	.056**	-

Notes. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ ; MR = Mother-reported; CR = Child-reported

**Table 2.4.** Model fit information of different LPA models

Classes	LL(df)	AIC	BIC	ABIC	LMR LR test	Bootstrap LR Test	Entropy
1-class	-15119.64 (16)	30271.29	30368.48	30317.64	-	-	
2-class	-13963.11 (27)	27980.23	28144.23	28058.44	2287.31***	-15119.64***	0.889
3-class	-13269.86 (38)	26615.72	26846.54	26725.80	1371.07***	-13963.11***	0.797
4-class	-13001.95 (49)	26101.90	26399.54	26243.85	529.85*	-13269.86***	0.809
<b>5-class</b>	<b>-12761.06 (60)</b>	<b>25642.12</b>	<b>26006.58</b>	<b>25815.93</b>	<b>476.42</b>	<b>-13001.95***</b>	<b>0.819</b>
6-class	-12567.30 (71)	25276.61	25707.88	25482.29	383.20**	-12761.06***	0.806

*Notes.* N = 3,211. \*  $p < 0.10$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ ; AIC: Akaike's information criterion. BIC: Bayesian information criterion. ABIC: Sample size adjusted Bayesian information criterion. LMR: Lo-Mendell Ruben adjusted likelihood ratio test. BLR: Bootstrap likelihood ratio test.

**Table 2.5.** 5-class LPA model of child physical health and psychosocial wellbeing

Profile 1		Profile 2	Profile 3	Profile 4	Profile 5	
	Total	Thriving	Mother-child discrepant	Thriving physical-At-risk psychosocial	At-risk physical- Struggling psychosocial	At-risk
Indicators	Probability	Probability	Probability	Probability	Probability	Probability
Overweight	0.41	0.38	0.44	0.39	0.50	0.58
Health problems	0.31	0.25	0.36	0.30	0.48	0.45
MR optimal health	0.85	0.89	0.85	0.76	0.70	0.60
CR optimal health	0.73	0.79	0.61	0.69	0.70	0.59
	Mean (SD)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
MR Internalizing	0.16 (0.16)	0.10 (0.06)	0.11 (0.01)	0.25 (0.04)	0.38 (0.04)	0.72 (0.06)
MR Externalizing	0.17 (0.18)	0.10 (0.04)	0.16 (0.01)	0.57 (0.04)	0.30 (0.03)	0.67 (0.10)
CR Internalizing	1.14 (0.70)	0.85 (0.02)	1.74 (0.04)	1.57 (0.12)	1.10 (0.07)	1.64 (0.09)
CR Externalizing	0.91 (0.72)	0.51 (0.02)	1.71 (0.04)	1.75 (0.15)	0.79 (0.07)	1.51 (0.15)
Expressiveness	1.47 (0.44)	1.54 (0.01)	1.45 (0.02)	1.32 (0.05)	1.30 (0.03)	1.08 (0.07)
Perseverance	2.42 (0.48)	2.53 (0.01)	2.22 (0.02)	2.13 (0.12)	2.41 (0.04)	2.15 (0.13)
Membership probability (γ)		0.903	0.862	0.865	0.827	0.919
N (%)	3,211 (100%)	1,953 (60.8%)	715 (22.3%)	139 (4.3%)	331 (10.3%)	73 (2.3%)

*Notes.* All sig  $p < .001$ . MR = Mother-reported; CR = Child-reported. Binary indicators: Overweight (1 =  $BMI \geq 85^{th}$  percentile); Health problems (1 = *Endorsed at least 1 of 6 health conditions*); Optimal health (1 = *Optimal health*). Continuous indicators: Child Behavior Checklist (CBCL) internalizing and externalizing (0-2); Self-Description Questionnaire (SDQ) internalizing and externalizing (0-3); Adaptive Social Behavior Inventory (ASBI) Expressiveness scale (0-2); Panel Study of Income Dynamics-Child Development Supplement (PSID-CDS-III) perseverance scale (0-4).

**Table 2.6.** Distribution of profile membership based on 5-year maternal depression, 9-year maternal depression, and changes in maternal depression

	Thriving	MC discrepant	Thriving physical- At-risk psychosocial	At-risk physical- Struggling psychosocial	At-risk	
	%	%	%	%	%	<i>p</i> <sup>a</sup>
<b>5-year Depression</b>						
No depression	62.1%	23.0%	3.8%	9.5%	1.6%	<.001
Had depression	52.1%	20.4%	7.7%	13.7%	6.1%	
<b>9-year Depression</b>						
No depression	63.9%	22.4%	3.6%	8.6%	1.6%	<.001
Had depression	46.0%	20.8%	8.3%	19.0%	5.9%	
<b>Change in Depression</b>						
No depression	64.4%	22.5%	3.5%	8.24%	1.3%	<.001
Depression remits	57.0%	24.1%	4.6%	9.8%	4.6%	
Depression onset	44.7%	25.3%	6.2%	19.4%	4.4%	
Depression both years	46.3%	15.3%	12.0%	18.1%	8.3%	
<b>Total %</b>	60.8%	22.3%	4.3%	10.3%	2.3%	
<b>N</b>	1,953	715	139	331	73	

*Notes.* Missing: 5-year depression (192), 9-year depression (12), Changes in depression (204). <sup>a</sup> Overall difference between groups.

**Table 2.7.** Relative risk ratio of child health and wellbeing latent profile membership (separate multinomial logistic regression analyses for maternal depression)

	<b>MC discrepant</b>	<b>Thriving physical- At-risk psychosocial</b>	<b>At-risk physical- Struggling psychosocial</b>	<b>At-risk</b>
	RRR [95% CI]	RRR [95% CI]	RRR [95% CI]	RRR [95% CI]
<b>5-year Maternal Depression</b>	1.04 [0.80-1.35]	2.06 [1.36-3.12]**	1.61 [1.18-2.20]**	4.34 [2.65-7.12]***
<b>9-year Maternal Depression</b>	1.12 [0.87-1.46]	2.53 [1.69-3.80]***	2.96 [2.22-3.94]***	5.07 [3.10-8.31]***
<b>Change in Maternal Depression</b>				
No depression	-	-	-	-
Depression remits	1.23 [0.91-1.69]	1.38 [0.74-2.58]	1.34 [0.86-2.09]	3.81 [1.92-7.55]***
Depression onset	1.41 [1.01-1.97]*	2.08 [1.16-3.74]*	3.31 [2.29-4.79]***	4.64 [2.28-9.43]***
Depression both years	0.82 [0.54- 1.28]	3.45 [2.05-5.79]***	2.67 [1.74-4.12]***	8.59 [4.52-16.31]***
<b>Reference group: Thriving profile</b>				

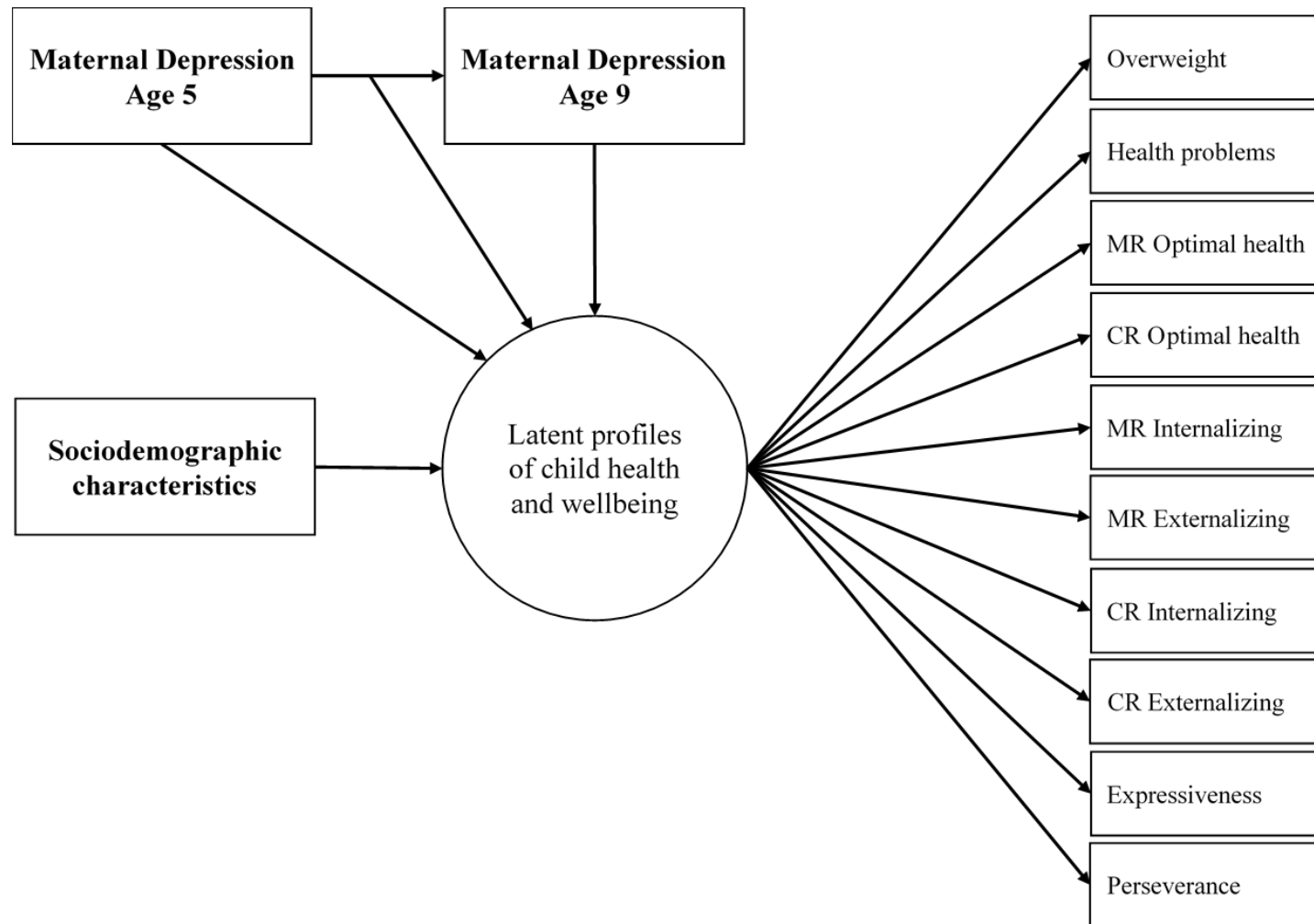
*Notes.* \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ . RRR = Relative risk ratio; CI = Confidence interval. 5-year depression status (n = 3,090); 9-year depression status (n = 3,019); Changes in depression status (n = 2,906). All analyses included the following covariates (missing): child sex, low birth weight (88), maternal age at birth (3), maternal race/ethnicity (7), maternal nativity status (9), maternal education (3), maternal marital status, and family poverty-to-income ratio.

**Table 2.8.** Predictive probabilities of latent class profiles by maternal depression

	Thriving	MC discrepant	Thriving physical- At-risk psychosocial	At-risk physical- Struggling psychosocial	At-risk
<b>5-year Maternal Depression</b>					
No depression	.642	.218	.031	.093	.014
Depression present	.558	.197	.056	.131	.056
<b>9-year Maternal Depression</b>					
No depression	.657	.214	.030	.082	.014
Depression present	.508	.186	.058	.189	.056
<b>Change in Maternal Depression</b>					
No depression	.661	.215	.029	.081	.011
Depression remits	.588	.237	.036	.097	.040
Depression onset	.489	.224	.046	.199	.040
Depression both years	.524	.141	.081	.172	.080

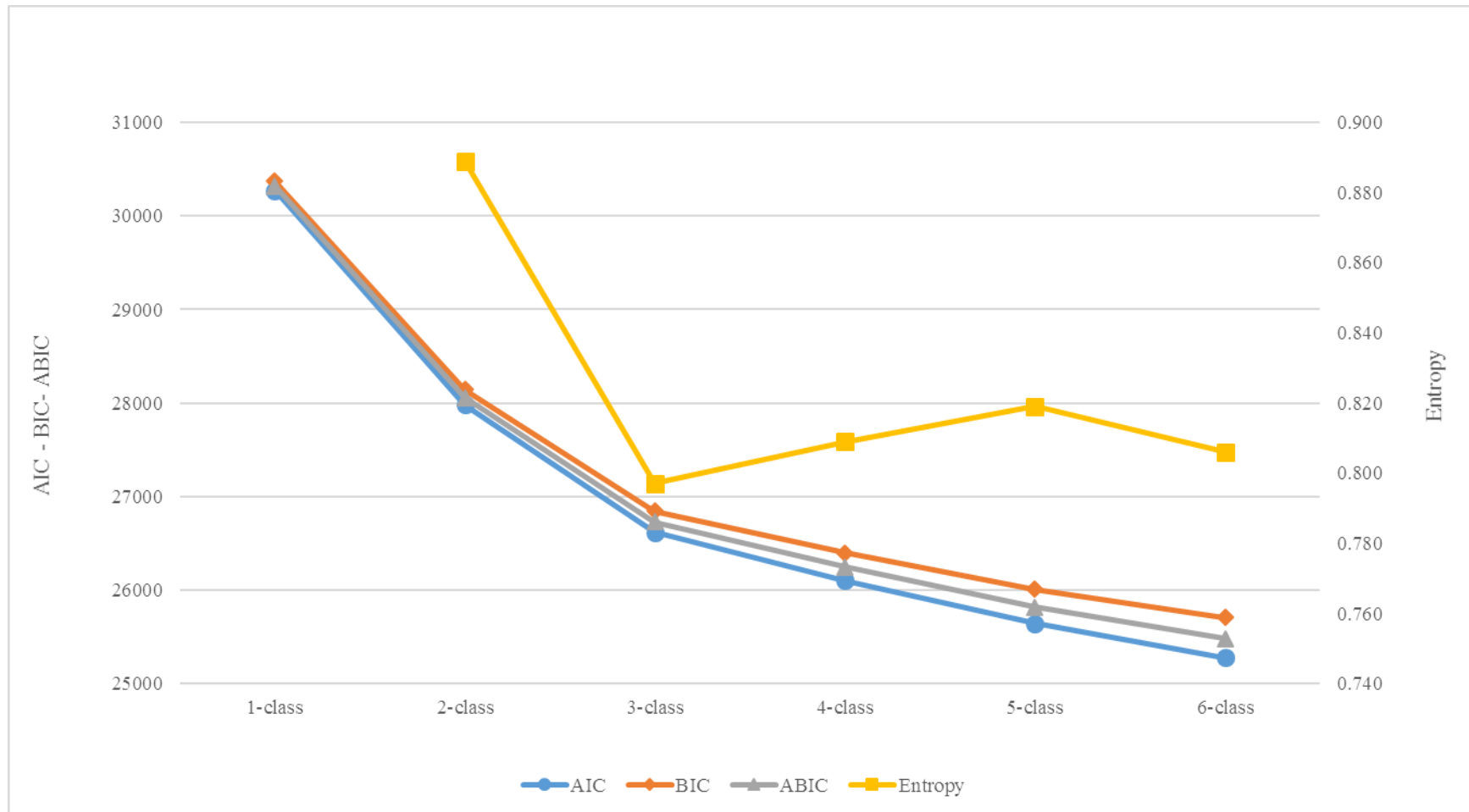
*Notes.* 5-year depression status (n = 3,090); 9-year depression status (n = 3,019); Change in depression status (n = 2,906). All analyses include the following covariates: child sex, low birth weight, maternal age at birth, maternal race/ethnicity, maternal nativity status, maternal education, maternal marital status, and family poverty-to-income ratio.

**Figure 2.1.** Conceptual model for paper 2

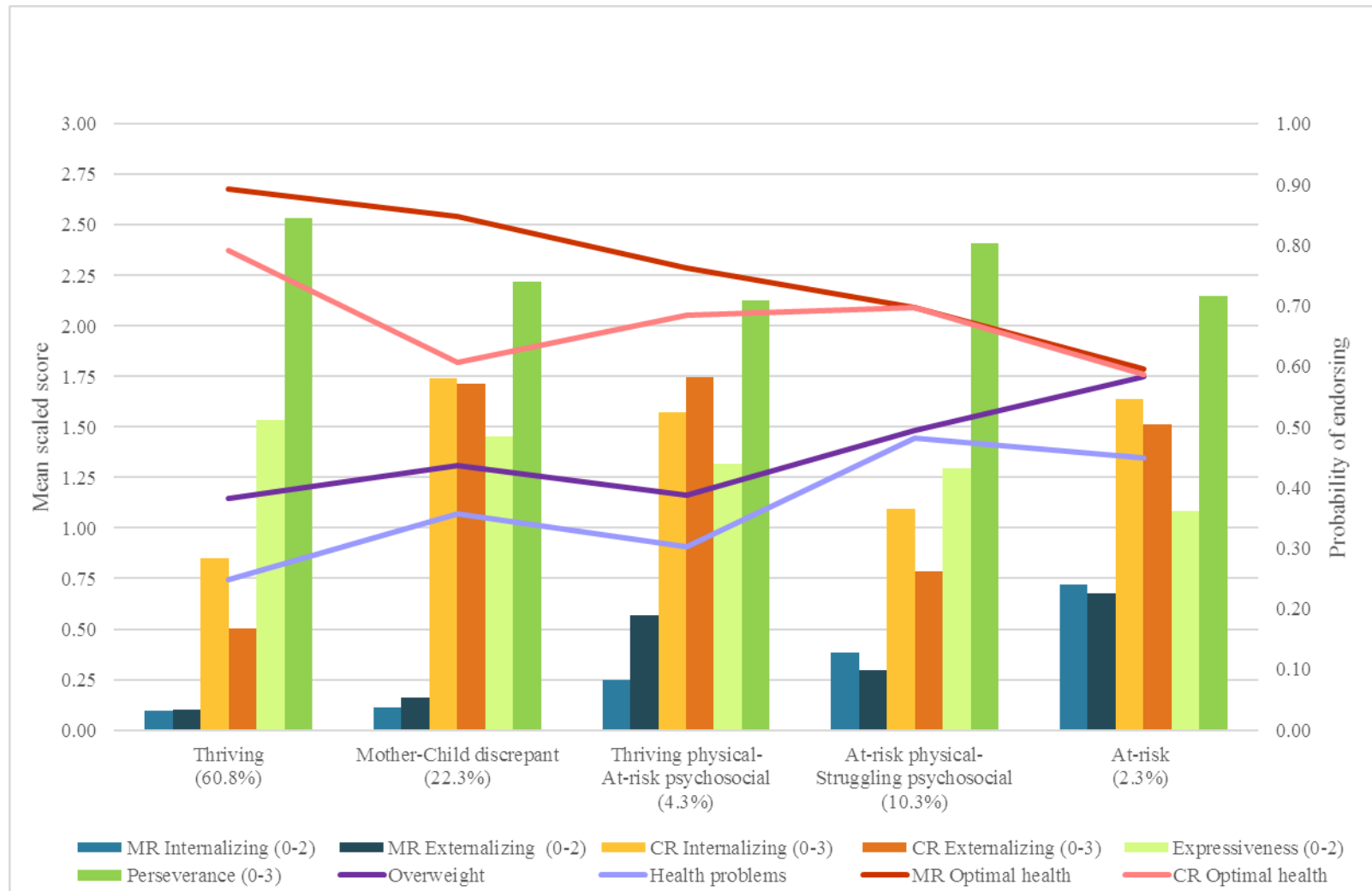


*Note.* MR= Mother-report, CR = Child-report.

**Figure 2.2.** Comparative and relative indices for latent profile analyses of child health and wellbeing (N = 3,211)



**Figure 2.3.** Latent profile characteristics of child physical health and psychosocial wellbeing (N = 3,211)



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## **Chapter IV. Resilience in the Maternal-Child Relationship for Mothers**

### **Experiencing Depression**

Maternal depression is a significant public health concern, with an average of 1 in 10 mothers suffering from a major depressive disorder in a given year, including but not limited to postpartum depression (Ertel, Rich-Edwards, & Koenen, 2011; Pratt & Brody, 2014). Depression, a serious psychiatric disorder, is characterized by persistently occurring dysphoria and/or anhedonia and other somatic, psychological, and behavioral symptoms (American Psychiatric Association, 2013). Depression increases the risk of functional impairment for mothers leading to increased risk of financial hardship, food and housing insecurity, and difficulty maintaining social relationships (American Psychiatric Association, 2013; Wang, Wu, Anderson, & Florence, 2011).

The rate of depression among mothers is highest during the first year after childbirth (up to 20% of mothers), which decreases during the years following to around 10-11% of mothers across childhood (Ertel et al., 2011; Le Strat, Dubertret, & Le Foll, 2011; Pratt & Brody, 2014). Broadly, maternal depression is used to describe depression occurring among women with children, as compared to the distinction of postpartum depression, which is when symptom onset occurs during the last month of gestation or within six months after delivery (American Psychiatric Association, 2013). Regardless of symptom onset, maternal depression represents a significant risk factor for poor child physical and psychosocial health outcomes, affecting over 7 million children annually (Ertel et al., 2011; Gladstone, Beardslee, & Diehl, 2015; Goodman et al., 2011; Hardie & Landale, 2013; Turney, 2012a).

## **Impact of Depression on Child Health and Wellbeing**

Maternal depression has been identified as an adverse childhood experience that increases the risk of immediate and long-term consequences related to physical and mental health and social wellbeing (Danese & McEwen, 2012; England & Sim, 2009; Felitti, 2009; Gilbert et al., 2015; Gladstone et al., 2015; Goodman et al., 2011). Research suggests that children of depressed mothers have higher levels of psychopathology and problem behaviors, as well as increased rates of physical health problems, like overweight/obesity, asthma, or frequent somatic complaints (England & Sim, 2009; Gladstone et al., 2015; Goodman et al., 2011; Lampard, Franckle, Davison, 2014; Turney, 2011). One of the most well-documented mechanisms through which maternal depression negatively impacts child health and wellbeing is through disruptions to the maternal-child relationship (Farmer & Lee, 2011; Gladstone et al., 2015; Goodman et al., 2011; Lampard et al., 2014; Turney, 2012a). It is one of the first social bonds a child will form and has a lasting influence on developmental trajectories and outcomes across the life course (Laible, Thompson, & Froimon, 2015).

## **Maternal Depression and the Maternal-Child Relationship**

Maternal depression may negatively impact three important areas of the maternal-child relationship, including the mother's perception of her parenting abilities, her parenting practices, and her involvement with her child (Dunst, Trivette, & Hamby, 2014; Farmer & Lee, 2011; van Doorn et al., 2016). Achieving parenting self-efficacy and mastery, maintaining consistent parenting practices, and meeting the daily emotional and physical needs of her child may be hindered as a result of dysphoria, anhedonia, and other symptoms associated with maternal depression (Farmer & Lee, 2011). More

specifically, mothers with depression may view parenting as more stressful and herself less competent as a parent (Farmer & Lee, 2011; Hardie & Turney, 2017; Turney, 2012a). Increased rates of stress and decreased rates of mastery may lead to less effective parenting behaviors, increasing the risk of harsh parenting practices and decreasing parent involvement (Farmer & Lee, 2011; Gladstone et al., 2015; Reupert & Maybery, 2007). Finally, depression can be functionally debilitating, leading to difficulty in attending to daily parenting tasks (American Psychiatric Association, 2013). As such, mothers experiencing depression may be less involved in daily activities with her child, including providing regular household routines or being involved in the child's school environment. The symptoms associated with maternal depression increase the risk for impaired caretaking capacity, leading to a 10-fold greater odds of a poor maternal-child relationship thereby increasing the risk of poor child health and wellbeing (Goodman et al., 2011; Hardie & Turney, 2017; Villodas, Bagner, & Thompson, 2015).

However, not all mothers with depression will experience a breakdown in the maternal-child relationship, underscoring the importance of examining differences in this relationship and identifying protective factors supporting this social bond. Maintaining a positive maternal-child relationship may act as a protective factor, thereby mitigating some of the negative effects maternal depression has on child health and wellbeing (Reuben & Shaw, 2015; Reupert et al., 2014). Positive perceptions of parenting ability, consistent parenting practices, and regular parent involvement are important elements impacting the maternal-child relationship. Importantly, few studies have examined the mechanisms that support these aspects of the maternal-child relationship in the context of maternal depression (Feldman, 2007; Goodman et al., 2011; Turney, 2012a; van Doorn et

al., 2016; Villodas et al., 2015). Identifying and understanding which factors support resilience in the maternal-child relationship is essential for informing policy and practice geared at preventing poor child health and wellbeing and supporting mothers with maternal depression.

### **Theoretical Framework**

From a resilience perspective, individuals experiencing adversity, like depression, have the potential to withstand and thrive despite the presence of risk (Liebenberg & Ungar, 2009; Masten, 2001; Masten, Powell, Luthar, 2003). This perspective suggests that not all individuals experiencing risk will go on to have negative outcomes, particularly when additional protective factors are present. As such, the risk conferred to child health and wellbeing associated with maternal depression may be mitigated if there is a positive maternal-child relationship. Additionally, a resilience framework supports that not all mothers experiencing depression will be at risk for a poor maternal-child relationship if they have access to protective factors, like interpersonal supports and community resources. In order to identify potential protective factors, the resilience perspective is often utilized in conjunction with the ecological systems theory.

From an ecological systems perspective, individuals are understood in the context of mutually reciprocal systems that directly and indirectly influence developmental trajectories and outcomes (Bronfenbrenner, 1986; Bronfenbrenner & Morris, 2006). An ecological systems perspective includes five major systems that surround the individual: 1) microsystem, 2) mesosystem, 3) exosystem, 4) macrosystem, and 5) chronosystem. The microsystem includes those with which the individual has a direct relationship and the mesosystem represents the relationships between the individual and those in the

microsystem (Bronfenbrenner, 1986). For example, for a child, the mother is an important member of the microsystem. Maternal depression represents a risk factor that exists within the microsystem that may negatively impact both the child and the maternal-child relationship, which is part of the mesosystem. The exosystem is comprised of formal and informal social supports and neighborhood climate that impact both the mother and child, individually, and may also impact the ways in which the mother and child interact with each other (Bronfenbrenner & Morris, 2006; Zhang, Eamon, & Zhan, 2015). Finally, the macrosystem is defined as the overarching ideologies and cultural norms, including the social norm that mothers are often primary caregivers and the chronosystems represents the importance of these processes over the life course (Bronfenbrenner, 1986; Bronfenbrenner & Morris, 2006).

Importantly, research has identified that a negative neighborhood context (e.g. lack of cohesion or safety) and limited interpersonal supports increase the risk of negative outcomes for mothers and children, especially when coupled with other risk factors like maternal depression (Dunst et al., 2014; World Health Organization, 2014; Zhang et al., 2015). In particular, higher levels of neighborhood disorder and a lack of social support can lead to increases in parenting stress, specifically for single mothers (Zhang et al., 2015). Furthermore, lower levels of social support and community order lead to an increased risk of negative parenting practices, including child maltreatment (Abner, 2014). Research has specifically focused on how negative environmental experiences increase risk, but few have examined how positive environmental factors may support resilient functioning in spite of adversity. Additionally, few studies have focused on the impact of environmental supports on the maternal-child relationship, specifically for

mothers with depression (Dunst et al., 2014; Feldman, 2007; World Health Organization, 2014; Zhang et al., 2015). Given that the maternal-child relationship is a key mechanism through which maternal depression impacts child health and wellbeing, it is important to identify factors supporting this relationship for these mothers.

### **Study Purpose and Aims**

Framed by the resilience and ecological systems perspectives, this study focused on how the maternal-child relationship (mesosystem) is impacted by perceived interpersonal support and community resources (exosystem), with the understanding that these systems indirectly and directly impact development across childhood. Protective factors like interpersonal support and community resources may support the mother, thereby mitigating the impact of maternal depression on parenting perceptions, practices, and involvement. Yet, few studies have examined the positive impact that interpersonal support and community resources may have on the maternal-child relationship in the context of maternal depression.

Thus, this study examined the differences between depressed and non-depressed mothers on three aspects of the maternal-child relationship: 1) perceptions of parenting abilities, 2) parenting practices, and 3) parent involvement for children aged 9 years old. Additionally, this study explored how interpersonal supports (e.g. instrumental and emotional supports) and community resources (e.g. neighborhood cohesion and safety) impacted those three aspects of the maternal-child relationship, specifically among mothers with depression at the 9-year follow-up.

### **Methods**

Data for these analyses were drawn from the Fragile Families and Child

Wellbeing (FFCWB) study, a longitudinal, cohort study of 4,898 children born in medium to large US cities between 1998 and 2000 to mainly single mothers (Reichman, Teitler, Garfinkel, & McLanahan, 2001; Waldfogel, Craigie, & Brooks-Gunn, 2010). The FFCWB study conducted interviews with biological mothers at or around the time of the child's birth (baseline), and then followed up 1-, 3-, 5-, and 9-years after baseline (Bendheim-Thoman Center for Research on Child Wellbeing, 2008; 2011). The FFCWB study includes data related to child physical health and psychosocial wellbeing, maternal health and wellbeing, economic status, parenting practices, social support and neighborhood cohesion, and other demographic characteristics (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

There were two study samples utilized for these analyses. Initial bivariate analyses utilized a study sample that included 3,212 observations from mothers who completed the 9-year follow-up with valid data for maternal depression. Observations were excluded if the child had a serious physical disability (e.g. Cerebral Palsy, Down's Syndrome,  $n = 109$ ) or did not live with the mother at least halftime at the 9-year follow-up ( $n = 208$ ). In total, 613 mothers met criteria for past year depression at the 9-year follow-up. However, 28 were excluded because their child had a serious physical disability and 66 were excluded because the mother was not the primary caregiver and the child did not live with her at least half time. Subsequent multivariate analyses were conducted with 522 mothers with depression at the 9-year follow-up. There were no differences between those included in the study sample and those excluded based on child sex ( $p = 0.915$ ), maternal age ( $p = 0.287$ ), maternal education ( $p = 0.338$ ), marital status ( $p = 0.317$ ), maternal race/ethnicity ( $p = 0.861$ ), or family income-to-poverty ratio

( $p = 0.423$ ).

## Measures

**Maternal depression.** Past 12-month depression diagnosis for mothers was assessed using the World Health Organization (WHO) Composite International Diagnostic Interview-Short Form (CIDI-SF) (World Health Organization, 1994). Past 12-month major depressive disorder was present if the mother endorsed either dysphoria or anhedonia on most days for at least two weeks and at least 3 additional symptoms (e.g. weight loss, suicidal thoughts, etc.). Mothers reporting taking medications for depression at the 9-year follow-up ( $n = 10$ ) were not asked about symptoms, but were coded as having a depressive disorder (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

**Maternal-child relationship.** The maternal-child relationship included items related to three broad areas: 1) perceptions of parenting; 2) parenting practices, and 3) parent involvement. Perceptions of parenting included two scales: 1) mother-reported parenting stress and 2) mother-reported parenting competence. Parenting stress was measured using the summed scaled score of four items from the Parenting Stress Inventory, related to difficulty of parenting, feeling trapped by parenting responsibilities, a lack of pleasure in parenting tasks, and feeling worn out by parenting responsibilities (Abidin, 1995). Items were measured on a 4-point Likert scale (0 = *strongly disagree* to 3 = *strongly agree*), with a higher score indicating greater stress related to being a parent. The Cronbach's alpha for the final study sample was 0.70.

Parenting competence was measured using a summed scaled score of three items related to perceptions of self as a good parent, feelings of closeness to the child, and

ability to communicate with the child (Blumberg et al., 2005). Items were measured on a 4-point Likert scale (0 = *not at all* to 3 = *extremely well*), with a higher score indicating greater levels of competence. The Cronbach's alpha for the study sample was 0.59.

Parenting practices related to types of disciplinary techniques mothers may employ was measured using the three subscales of the Parent-Child Conflict Tactics Scale (Straus, 1979): 1) non-violent discipline, 2) physical assault, and 3) psychological aggression. The non-violent discipline subscale has four items, with items like putting the child in "time out" or taking away privileges (Cronbach's alpha = 0.81). The physical assault subscale consists of five items, including whether the mother ever pinched, slapped, or shook the child (Cronbach's alpha = 0.75). The psychological aggression subscale had five items, including items related to cursing at the child or threatening to hit the child (Cronbach's alpha = 0.60). Item responses were initially on a 7-point scale, with 0 (*never used or not in the past year*) to 6 (*more than 20 times*). Items were coded using the yearly frequency method, which produces a summed scaled score of frequency estimates for disciplinary techniques ranging from 0-100 for non-violent discipline scale and 0-125 for psychological aggression and physical assault scales (Bendheim-Thoman Center for Research on Child Wellbeing, 2011).

Finally, parent involvement was measured using two scales, one focusing on involvement at home and the other at school. Home involvement included 10-items related to past-month interactions between the mother and child in the home. Mothers were asked how often she engaged in activities with her child related to household routines (e.g. doing chores together), recreational activities (e.g. playing outside together), and academic support at home (e.g. helped with homework). Responses were

on a 5-point Likert-scale (0 = *not once in past month* to 4 = *everyday*), and were used to generate a summed scaled score, with a higher score representing more parent involvement at home. The Cronbach's alpha for the study sample was 0.70.

School involvement included 6-items related to past-year interactions between the mother and the child's school. Mothers were asked how often she attended school functions (e.g. open house, class/school event), volunteered at the child's school, and visited the child's classroom. Of note, items related to potential academic problems (e.g. conference with school counselor or principal) were excluded. Responses were on a 3-point Likert-scale (0 = *never* to 2 = *more than once*) and were used to generate a summed scaled score, with a higher score representing more parent involvement at school. The Cronbach's alpha for the study sample was 0.72.

***Interpersonal support.*** Interpersonal support included two scaled scores related to perceived instrumental and emotional support. Perceived instrumental support was measured using the 5-item Instrumental Social Support Measure (Reid & Taylor, 2015). Mothers indicated whether or not she could count on someone to provide different types of financial support (e.g. loan \$200 or cosign for bank loan), a place to live if homeless, and emergency child care if needed. Items were summed to create a scale score ranging from 0 (*no supports*) to 5 (*all supports listed*), with a higher score indicating more perceived instrumental support. The Cronbach's alpha for the study sample was 0.70. Perceived emotional support included whether or not the mother could get help or advice from 5 different potential supports: 1) her parents, 2) the child's father, 3) the child's father's parents or relatives, 4) friends, neighbors, coworkers, or 5) other relatives. Items were used to generate a summed scaled score ranging from 0 (*no supports*) to 5 (*all*

*supports listed*), with a higher value representing access to more social supports for help or advice. The Cronbach's alpha for the study sample was 0.50.

**Community resources.** Community resources included two measures related to neighborhood cohesion and safety. Neighborhood cohesion was measured using the validated 5-item Social Cohesion and Trust Scale (Sampson, Raudenbush, & Earls, 1997). Items asked mother's level of agreement on the following statements: 1) willingness of neighbors to help, 2) neighborhood is viewed as close-knit, 3) people generally do not get along with each other, 4) people do not share the same values, and 5) gangs are a problem in the neighborhood, using a 4-point Likert scale (0 = *strongly disagree* to 3 = *strongly agree*). Items 3, 4, and 5 were recoded so that a lower level of agreement was coded as being more positive. After recoding, a summed scaled score was generated, with higher score representing higher levels of neighborhood social cohesion. The Cronbach's alpha for the study sample was 0.78. Finally, neighborhood safety was a dichotomous single-item indicator. Mothers were asked if they were afraid to let her child go outside because of violence in the neighborhood, which was recoded so a yes response indicates neighborhood safety.

**Covariates.** These analyses also controlled for child, maternal, and family factors. Child factors included child sex (0 = *male*, 1 = *female*) and child age in years. Maternal factors included age in years, race/ethnicity (0 = *Non-Hispanic white*, 1 = *Non-Hispanic black*, 2 = *Hispanic or other*), education (0 = *less than high school*, 1 = *high school*, 2 = *more than high school*), current marital status (0 = *married*, 1 = *single*), and the number of children in the household. Finally, current family income-to-poverty ratio based on the annual poverty thresholds established by the US Census Bureau were

included (Bendheim-Thoman Center for Research on Child Wellbeing, 2011). See Table 3.1 for variable descriptions and Figure 3.1 for the conceptual model.

### **Analytic Approach**

First, descriptive analyses were conducted to examine the differences in perceptions of parenting, parenting practices, and parent involvement between mothers with past 12-month depression as compared to those without a current diagnosis of depression. Second, we conducted a series of multivariate regression analyses to examine the relationship between each outcome related to parenting perceptions, practices, and involvement with interpersonal and community resources for mothers with depression controlling for covariates. We then examined the association between perceptions of parenting with parenting practices and involvement for depressed mothers, adjusting for covariates. All regression models were assessed for multicollinearity using tolerance and variance inflation factor (VIF), which were all in range.

Next, structural equation model (SEM) analyses were conducted to examine the impact of interpersonal and community resources on parenting perceptions, and then perceptions on parenting practices and involvement. All models controlled for the covariates described above. SEM model fit indices included the overall model chi-square, comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). A nonsignificant chi-square, a CFI of .95 or greater, an RMSEA of .05 or lower, and an SRMR of .05 or lower indicate acceptable model fit (Kline, 2015).

Finally, Little's Missing Completely at Random (MCAR) test showed that missing data for key variables were missing completely at random,  $\chi^2(65) = 81.3, p =$

.084. As such, missing data were treated with maximum likelihood estimation based on the data being MCAR (Acock, 2005). Although survey weights were not used, the variables used to generate survey weights were included in multivariate regression and SEM analyses and robust standard errors were estimated per recommendation by the Fragile Families investigators (Bendheim-Thoman Center for Research on Child Wellbeing, 2008). All analyses were conducted in Stata 13/SE (StataCorp, 2013).

### Results

Sample characteristics for the total sample, non-depressed mothers, and mothers with depression are presented in Table 3.2. Overall, the average age for mothers was 34.5 ( $SD = 6.04$ ) and for the focal child was 9.3 years old ( $SD = 0.38$ ). The majority of mothers were non-Hispanic black (49.3%), born in the US (85.1%), and were unmarried to the baby's father (75.8%). Most mothers had at least a high school education (68.8%) and 61.5% were at or below 199% of the federal income-to-poverty level. Just over 16% of mothers had a current diagnosis of depression. However, mothers with depression were significantly younger ( $p = 0.006$ ), more likely to be US born ( $p = 0.001$ ), had less education ( $p < 0.001$ ), were more likely to be a single mother ( $p < 0.001$ ), have more children in the home ( $p = 0.008$ ), and have lower income ( $p < 0.001$ ) than their non-depressed counterparts.

Bivariate analyses were conducted to explore the associations between maternal depression and aspects of the maternal-child relationship, as well as the levels of interpersonal supports and community resources (Table 3.3). Depressed mothers reported higher rates of parenting stress and lower rates of parenting competence as compared to non-depressed mothers. Additionally, depressed mothers were more likely to engage in

all types of disciplinary practices, including increased rates of psychological aggression and physical assault as compared to non-depressed mothers. Mothers with depression reported lower levels of school involvement, but there was no difference in the level of home involvement. Finally, depressed mothers reported lower levels of instrumental support, emotional support, and social cohesion, and were less likely to report their neighborhood was safe.

Adjusted regression analyses were conducted to examine the independent associations between the three aspects of the maternal-child relationship and perceived emotional support, instrumental support, neighborhood cohesion, and neighborhood safety for mothers with depression, controlling for covariates (Table 3.4). After adjusting for covariates, perceived instrumental support was associated with increased school involvement ( $B = 0.29, \beta = 0.14, p = .007$ ), suggesting that a 1-unit increase in instrumental support increased school involvement by 0.29 scaled score points. Perceived emotional support was associated with greater parenting competence ( $B = 0.12, \beta = 0.10, p = 0.027$ ), home involvement ( $B = 0.37, \beta = 0.08, p = 0.037$ ), and school involvement ( $B = 0.25, \beta = 0.10, p = 0.027$ ). Neighborhood cohesion was associated with lower parenting stress ( $B = -0.09, \beta = -0.11, p = 0.016$ ) and greater parenting competence ( $B = 0.05, \beta = 0.13, p = 0.006$ ). Additionally, neighborhood safety was associated with lower parenting stress ( $B = -1.03, \beta = -0.16, p = .001$ ). However, interpersonal supports and community resources were not associated with any parenting practices and community resources were not associated with parenting involvement.

For depressed mothers, perceptions of parenting were associated with parenting practices and involvement. Greater parenting stress was associated with higher rates of

nonviolent discipline ( $B = 1.22, \beta = 0.12, p = 0.005$ ), physical assault ( $B = 1.08, \beta = 0.16, p = 0.001$ ), and psychological aggression ( $B = 0.68, \beta = 0.16, p = 0.001$ ), as well as lower rates of home involvement ( $B = -0.19, \beta = -0.10, p = 0.031$ ) and school involvement ( $B = -0.14, \beta = -0.13, p = 0.003$ ), controlling for covariates. Conversely, greater parenting competence was related to lower rates of nonviolent discipline ( $B = -2.49, \beta = -0.13, p = 0.005$ ) and psychological aggression ( $B = -2.35, \beta = -0.18, p = 0.001$ ), as well as higher rates of home involvement ( $B = 0.98, \beta = 0.26, p < 0.001$ ) and school involvement ( $B = 0.30, \beta = 0.14, p = 0.002$ ), controlling for covariates.

Finally, an SEM model was conducted to simultaneously estimate interpersonal support and community resources on parenting perceptions, and then parenting perceptions on parenting practices and involvement (Figure 3.2). The final model had acceptable fit, with a non-significant chi-square ( $\chi^2(6) = 8.11, p = 0.230$ ), an RMSEA of 0.028, 90% CI [0.00-0.71], a CFI of 0.997, and an SRMR of 0.007. The model allowed for covariance of the error terms between each aspect of the parent-child relationship (i.e. parenting perceptions, parenting practices, and parenting involvement, separately). Overall, the model explained 46.7% of the variance in all estimated endogenous outcomes (perceptions of parenting, parenting practices, and parent involvement) related to the parent-child relationship ( $R^2 = 0.47$ ). By outcome, the model accounted for 5.6% of the variance of parenting stress, 8.1% of parenting competence, 15.2% of nonviolent discipline, 10.0% of physical assault, 17.3% of psychological aggression, 18.3% of home involvement, and 12.7% of school involvement.

When controlling for covariates, results indicated that higher levels of both emotional support and neighborhood cohesion were associated with greater parenting

competence. On the other hand, only neighborhood safety was associated with lower parenting stress. Additionally, parenting stress was associated with increased rates of nonviolent discipline, physical assault, and psychological aggression, and lower rates of academic involvement, but was not associated with home involvement. Parenting competence was associated with decreased rates of nonviolent discipline and psychological aggression, and higher rates of home involvement, but did not predict physical assault or school involvement.

Finally, instrumental support and neighborhood cohesion were related to an increased rate of school involvement. No other interpersonal supports or community resources were directly associated with parenting practices or involvement. Finally, we estimated the indirect effects of interpersonal supports and community resources on parenting practices and involvement through perceptions of parenting. Neighborhood cohesion had a significant indirect effect on psychological aggression ( $\beta = -0.16, p = .035$ ) and home involvement ( $\beta = 0.05, p = .019$ ). There were no other significant indirect effects.

## **Discussion**

The overall purpose of this study was to examine how external protective factors support a positive maternal-child relationship in the context of maternal depression, with the understanding that a disruption to this social bond is a critical factor with negative consequences for child health and wellbeing (Gladstone et al., 2015; Reuben & Shaw, 2015; Reupert & Maybery, 2007; Reupert et al., 2014). Findings suggest that mothers with depression were less likely to hold positive parenting perceptions, were at a greater risk of engaging in negative parenting practices, and were less likely to be involved at the

child's school as compared to non-depressed mothers. Yet, there was no difference in involvement at home between mothers with or without current depression. Furthermore, mothers with depression reported fewer interpersonal supports and community resources than non-depressed mothers, which is consistent with previous literature (World Health Organization, 2014).

When examining the impact of these protective factors among depressed mothers, we found that interpersonal supports and community resources did not have a direct impact on parenting practices and, separately, community resources were not associated with parent involvement. However, interpersonal supports were associated with home and school involvement. Notably, parenting perceptions were the strongest predictors of parenting practices and involvement in this model. Specifically, parenting competence was associated with fewer disciplinary practices, whereas parenting stress indicated the opposite, highlighting the importance of parenting perceptions for mothers with depression. These findings were consistent with previous literature (Farmer & Lee, 2011; Hardie & Landale, 2013; Turney, 2012b; van Doorn et al., 2016) and suggest that the perceptions a mother holds about parenting stress and competence plays an important role in the way she disciplines and interacts with her child.

Our findings extend the current literature base by examining the effects of environmental factors influencing the maternal-child relationship for depressed mothers. We found that neighborhood cohesion and interpersonal supports directly impacted perceptions of parenting. Similarly to the research focusing on single and low-income women (Abner, 2014; Dunst et al., 2014; Zhang et al., 2015), we found that higher levels of social support and cohesion were associated with positive outcomes in mothers with

depression. In particular, these factors were related to higher levels of parenting competence and lower levels of parentings stress. Furthermore, higher levels of neighborhood cohesion were associated with decreased rates of psychological aggression and increased rates of home involvement through perceptions of parenting. Utilizing an SEM approach provided important information as to how these variables interact with each other simultaneously. Grounded in ecological systems and resilience perspectives, these findings provide empirical support underscoring the importance of external resources, like instrumental or emotional support, neighborhood cohesion, and neighborhood safety, for the maternal-child relationship in the context of maternal depression.

### **Limitations**

This study had some important limitations. First, the parent-child relationship was measured using scales related to perceptions of parenting, parenting practices, and parent involvement, but did not include a validated measure of relationship quality (e.g. parent warmth or hostility). Maternal warmth and hostility are common relationship quality indicators that were not available in these data. Relationship quality may impact the degree to which involvement is beneficial or detrimental to the child (van Doorn et al., 2016). For example, greater involvement with high levels of hostility may actually be worse for child outcomes, whereas low levels of involvement that are characterized by high levels of warmth may be more beneficial. Additionally, the relationship was measured exclusively using self-report from the mother, and did not take into account the child's perceptions of the relationship or include observations from a trained interviewer. It would be important for future research to include a measure of relationship quality, as

well as reports from other respondents. Second, our analyses did not include a measure of depression symptom onset, severity, or chronicity, which may play an important role for the maternal-child relationship. Symptom onset that occurs during the postpartum period may negatively impact early attachment, leading to difficulties in the maternal-child relationship that persist. Future analyses should take into account the timing, severity, and onset of depressive symptoms, and the degree to which protective factors support a positive maternal-child relationship across childhood. Finally, it is important to note that these indicators were measured concurrently and do not include the temporal order necessary to establish causality.

### **Implications**

Given the importance of the maternal-child relationship and the potential negative effects of maternal depression, understanding how mothers maintain a positive relationship with her child is essential for supporting optimal child health and wellbeing (Farmer & Lee, 2011; Turney, 2012a; van Doorn et al., 2016). To that end, this study highlighted three aspects of the maternal-child relationship for which social workers and clinical practitioners may have the greatest influence. Findings indicated that depressed mothers were equally involved with their child at home, but more likely to hold negative views of their parenting competency and perceived parenting as more stressful. As such, interventions for mothers with depression should include psychoeducation regarding typical parenting experiences and address the appraisal of parenting stress and competence. Additionally, these analyses suggest that external supports have an important influence on perceptions of parenting competence and stress, yet mothers with depression reported fewer interpersonal supports and community resources. Supporting

mothers by developing community resources and building social capital may help to mitigate the risks associated with maternal depression. Furthermore, programs should focus on more than just preventing problems (i.e. preventing maltreatment), and should also incorporate capacity-building that supports mothers in identifying interpersonal and community resources (Dunst & Trivette, 2009).

Importantly, mothers experiencing depression may not seek help specifically related to their mental health concerns (Coiro, 2015a; Mishina & Takayama, 2009), but may be involved with other community programs. Findings from this study further support the potential benefit of developing local, place-based approaches aimed at prevention instead of focusing on programs geared towards intervening once problems emerge (Hawkins et al., 2015). To that end, community-based parenting classes should provide mothers with the opportunity to build interpersonal supports and community resources, thereby supporting the potential for a positive maternal-child relationship despite maternal depression. In particular, programs like *Promising Neighborhoods* (Abner, 2014) are intended to build community support systems and improve resources for at-risk neighborhoods, and should include specific elements related to depression among mothers.

Additionally, findings from this study provide support for a two-generation approach to public policy to address maternal depression and improve child health and wellbeing (Schmit, Matthews, & Golden, 2014). Children experiencing maternal depression with a more positive maternal-child relationship may be at less of a risk of developing negative outcomes (Farmer & Lee, 2011; Feldman, 2007; Hardie & Landale, 2013; Repetti et al., 2002). Two-generation policy programs (e.g. Head Start) have been

successful in meeting the needs of both the child and mother, yet many of them focus only on very young children (Schmit et al., 2014). Utilizing a two-generation approach in primary care settings could provide important opportunities to support children and mothers experiencing risk. This may include screening for maternal depression and other mental illness throughout childhood during well-child check-ups, offering psychoeducation for mothers regarding parenting expectations and practices, and providing access to community resources for mothers in a primary care setting. As such, developing interpersonal and community supports for all mothers, including those experiencing depression, may impact the immediate and long-term health of children.

**Table 3.1.** Description of key study variables

<b>Selection Variable</b>	<b>Interview Item</b>	<b>Coding</b>
Maternal depression	Met CIDI criteria for major depression	0 did not meet criteria for depression 1 met criteria for depression
<b>Outcomes: <i>Mother-Child Relationship</i></b>		
<b><i>Perceptions of parenting</i></b>		
Parenting stress	1. Taking care of children is harder 2. Feel trapped by responsibilities 3. Parenting is more work than pleasure 4. Often feel tired/worn out/exhausted from raising a family	Range: 0 strongly disagree to 3 strongly agree Summed score (0-12)
Parenting competence	1. Rating of self as a caregiver/parent 2. Rating of closeness felt with child 3. Rating of how well communicate with child	Range: 0 not at all good to 3 excellent Summed score (0-9)
<b><i>Parenting practices</i></b>		
Parent-Child Conflict Tactics Scale	Yearly frequency rate for three subscales: 1. Non-violent discipline (e.g. time out) 2. Psychological aggression (e.g. threatened to hit) 3. Physical assault (e.g. hit)	Range: 0 never -25+ times Summed score (0-100) Summed score (0-125) Summed score (0-125)
<b><i>Parenting involvement</i></b>		
Home involvement	Frequency mother engaged in activities with her child: 1. Did household chores 2. Played sports or outdoor activities 3. Watched TV or videos 4. Played video or computer game 5. Read books or talked about books 6. Participated in indoor activities 7. Talked about current events 8. Talked about child's day 9. Checked child's homework was complete 10. Helped with homework	Range: 0 not once to 4 everyday Summed score (0-40)

School involvement	<p>Have you done this in the past school year?</p> <ol style="list-style-type: none"> <li>1. Attended open house or back to school night</li> <li>2. Attended a PTA/PTO meeting</li> <li>3. Gone to a parent-teacher conference</li> <li>4. Attended school/class event</li> <li>5. Volunteered at the school or on a committee</li> <li>6. Visited child's classroom</li> </ol>	<p>Range: 0 = No – 2 More than once Summed score (0-12)</p>
<hr/> <b>Key predictors</b> <hr/>		
<i>Interpersonal supports</i>		
Instrumental Support	<p>If you needed help, could you count on someone to:</p> <ol style="list-style-type: none"> <li>1. Loan you \$200</li> <li>2. Loan you \$1,000</li> <li>3. Provide you a place to live</li> <li>4. Help you with emergency child care</li> <li>5. Cosign for a bank loan up to \$1000</li> </ol>	<p>0 support not available 1 support available Summed score (0-5)</p>
Emotional support	<p>Can you ask ____ for help or advice?</p> <ol style="list-style-type: none"> <li>1. Your parents</li> <li>2. Child's father</li> <li>3. Child's grandparents</li> <li>4. Other relatives</li> <li>5. Friends, neighborhood, or coworkers</li> </ol>	<p>0 support not available 1 support available Summed Score (0-5)</p>
<i>Community Resources</i>		
Neighborhood Social Cohesion and Trust	<p>Amount of agreement with statements about your neighborhood and the people who live there:</p> <ol style="list-style-type: none"> <li>1. People willing to help their neighbors</li> <li>2. Close knit neighborhood</li> <li>3. People in neighborhood do not get along (reversed)</li> <li>4. People in neighborhood do not share values (reversed)</li> <li>5. Gangs are problem in neighborhood (reversed)</li> </ol>	<p>0 strongly disagree to 3 strongly agree Summed score (0-15)</p>
Neighborhood safety	<p>Are you afraid to let your child go outside because of violence?</p>	<p>0 afraid to let child go outside 1 not afraid to let child go outside</p>

**Table 3.2.** Descriptive statistics for key variables by maternal depression

	<b>Total</b>	<b>No current depression</b>	<b>Current depression</b>	
	<b>%(N)/M(SD)</b>	<b>%(N)/M(SD)</b>	<b>%(N)/M(SD)</b>	<b>Sig<sup>a</sup></b>
<b>Child is a girl</b>	47.7 (1,532)	48.2 (1,298)	44.8 (234)	0.154
<b>Child age (years)</b>	9.3 (0.38)	9.3 (0.01)	9.3 (0.02)	0.401
<b>Maternal age (years)</b>	34.5 (6.04)	34.6 (6.07)	33.8 (5.79)	0.006
<b>Maternal race/ethnicity</b>				
Non-Hispanic white	21.3 (683)	21.1 (567)	22.3 (116)	0.137
Non-Hispanic black	49.3 (1,580)	48.8 (1,310)	51.9 (270)	
Hispanic/Other	29.4 (943)	30.1 (809)	25.8 (134)	
<b>Mother US born</b>	85.1 (2,726)	84.2 (2,259)	89.6 (467)	0.001
<b>Maternal Education</b>				
Less than high school	31.3 (1,003)	29.9 (804)	38.2 (199)	< 0.001
High school	31.3 (1,003)	31.4 (843)	30.9 (161)	
More than high school	37.5 (3,210)	38.7 (1,042)	30.9 (161)	
<b>Single mother</b>	38.3 (1,215)	36.7 (976)	46.5 (239)	< 0.001
<b>Number of children in the home</b>	2.74 (1.30)	2.72 (1.27)	2.88 (1.43)	0.008
<b>Family income-to-poverty ratio</b>				
0-49%	16.7 (531)	15.2 (405)	24.4 (126)	< 0.001
50-99%	19.3 (616)	18.2 (486)	25.2 (130)	
100-199%	29.3 (934)	29.7 (794)	27.1 (140)	
200-299%	14.1 (450)	15.0 (400)	9.7 (50)	
300%+	20.6 (659)	22.0 (588)	13.7 (71)	
<b>N (%)</b>	3,213	2,691 (83.8%)	522 (16.2%)	

*Notes.* Missing: Maternal age (3), maternal race/ethnicity (7), maternal nativity status (9), maternal education (3), maternal marital status (37), number of household children (14), family income-to-poverty (23). <sup>a</sup> Overall difference between depressed and non-depressed mothers (ttest for continuous variables, chi-square for categorical variables).

**Table 3.3.** Parent-child relationship factors, interpersonal supports, and community resources by maternal depression

	Total	No Maternal Depression	Maternal depression	
	%(N)/M(SD)	%(N)/M(SD)	%(N)/M(SD)	<i>Sig<sup>a</sup></i>
<b>Perceptions of Parenting</b>				
Parenting stress	4.11 (2.72)	3.88 (2.62)	5.32 (2.92)	< 0.001
Parenting competence	7.18 (1.47)	7.23 (1.45)	6.94 (1.51)	< 0.001
<b>Parenting Practices</b>				
Non-violent discipline	31.32 (26.74)	30.63 (26.36)	34.84 (28.38)	0.002
Physical assault	4.99 (9.03)	4.61 (8.24)	6.94 (12.13)	< 0.001
Psychological aggression	14.48 (17.19)	13.32 (16.27)	20.42 (20.29)	< 0.001
<b>Parent Involvement</b>				
Home involvement	27.34 (5.68)	27.33 (5.66)	27.35 (5.74)	0.962
School involvement	6.95 (3.12)	7.00 (3.11)	6.69 (3.15)	0.029
<b>Interpersonal Supports</b>				
Perceived instrumental support	3.76 (1.42)	3.84 (1.37)	3.29 (1.58)	< 0.001
Perceived emotional support	1.99 (1.34)	2.03 (1.36)	1.80 (1.26)	< 0.001
<b>Community Resources</b>				
Neighborhood cohesion	9.78 (3.48)	9.93 (3.44)	9.01 (3.57)	< 0.001
Neighborhood safety	81.2 (2,600)	82.9 (2,223)	72.5 (377)	< 0.001

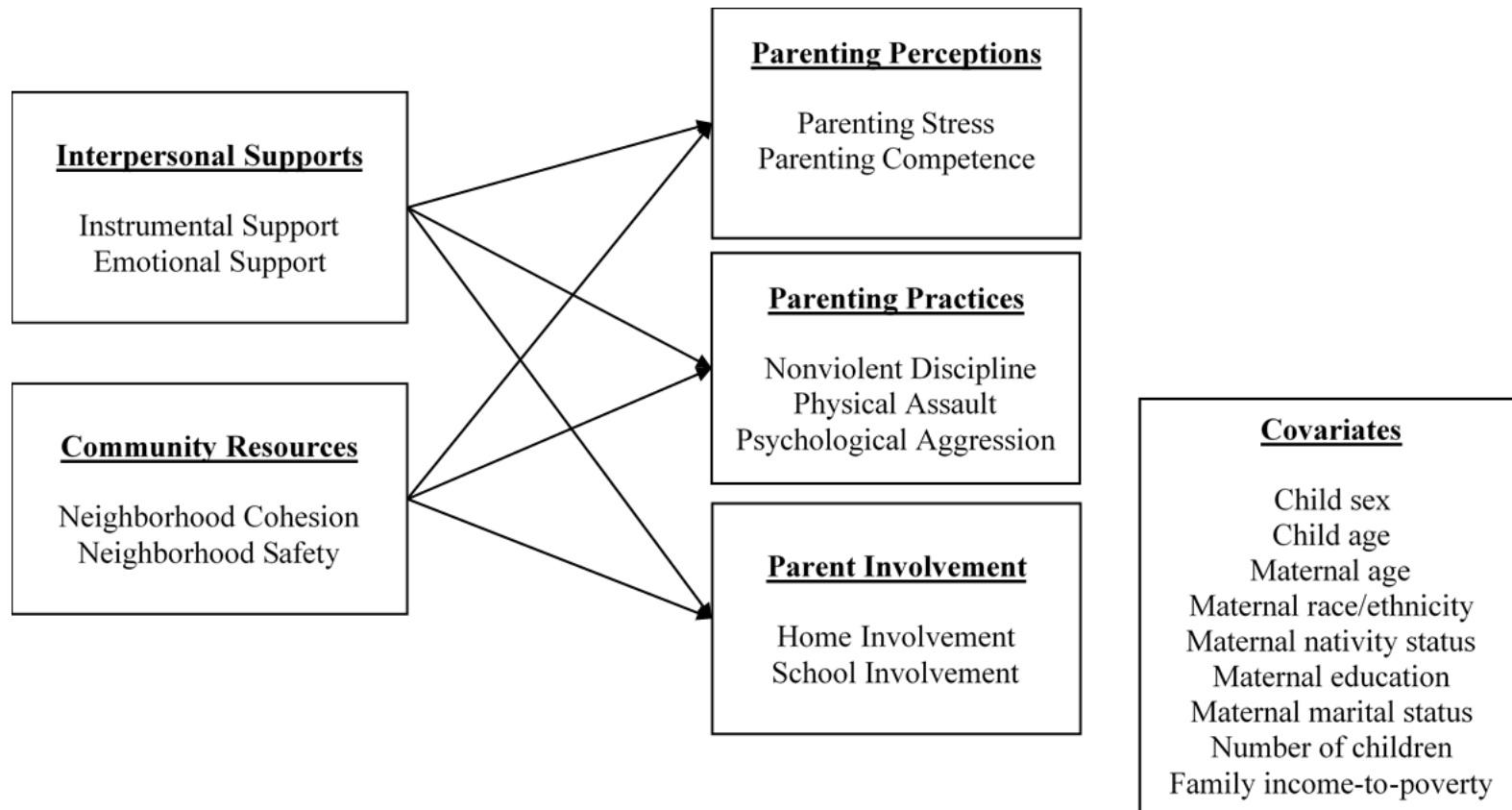
*Notes.* Scale range: Parenting stress (0-12); Parenting competence (0-9); Non-violent discipline (0-100); Physical aggression (0-125); Physical assault (0-125); Home involvement (0-40); School involvement (0-12); Instrumental support (0-5); Emotional support (0-5); Neighborhood cohesion (0-15); Neighborhood safety (0-1). <sup>a</sup> Overall difference between depressed and non-depressed mothers (ttest for continuous variables, chi-square for categorical variables).

**Table 3.4.** Independent associations between maternal-child relationship and interpersonal supports and community resources reporting standardized coefficients and robust standard errors

	Parenting Perceptions		Parenting Practices			Parent Involvement	
	Parenting Stress	Parenting Competence	Nonviolent Discipline	Physical Assault	Psychological Aggression	Home Involvement	School Involvement
	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)
<b>Interpersonal Support</b>							
Instrumental support	-0.09 (0.10)	0.08 (0.05)	0.07 (0.95)	-0.01 (0.38)	0.05 (0.65)	0.03 (0.20)	0.14 (0.11)**
Emotional support	0.03 (0.10)	0.10 (0.06)*	0.05 (1.06)	0.02 (0.43)	0.06 (0.74)	0.08 (0.17)*	0.10 (0.11)*
<b>Community Resources</b>							
Neighborhood cohesion	-0.11 (0.04)*	0.13 (0.02)**	-0.03 (0.39)	-0.02 (0.15)	-0.05 (0.26)	0.05 (0.07)	0.09 (0.04)
Neighborhood safety	-0.16 (0.30)**	0.05 (0.16)	0.04 (2.96)	-0.04 (1.38)	-0.03 (2.09)	0.01 (0.57)	-0.01 (0.32)
<b>Parenting perceptions</b>							
Parenting stress	-	-	0.13 (0.44)**	0.16 (0.20)***	0.16 (0.31)***	-0.10 (0.09)*	-0.13 (0.05)**
Parenting competence	-	-	-0.13 (0.88)**	-0.12 (0.50)	-0.18 (0.70)***	0.26 (0.16)***	0.14 (0.10)**

*Notes.* \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .  $\beta$  = Standardized coefficients with robust standard error. Models controlled for child sex and age, maternal age, maternal race/ethnicity, maternal nativity status, maternal education, mother single, family poverty-to-income ratio and the number of children in the household. Scale range: Parenting stress (0-12); Parenting competence (0-9); Non-violent discipline (0-100); Physical aggression (0-125); Physical assault (0-125); Home involvement (0-40); School involvement (0-12); Instrumental support (0-5); Emotional support (0-5); Neighborhood cohesion (0-15); Neighborhood safety (0-1).

**Figure 3.1.** Conceptual model for Paper 3

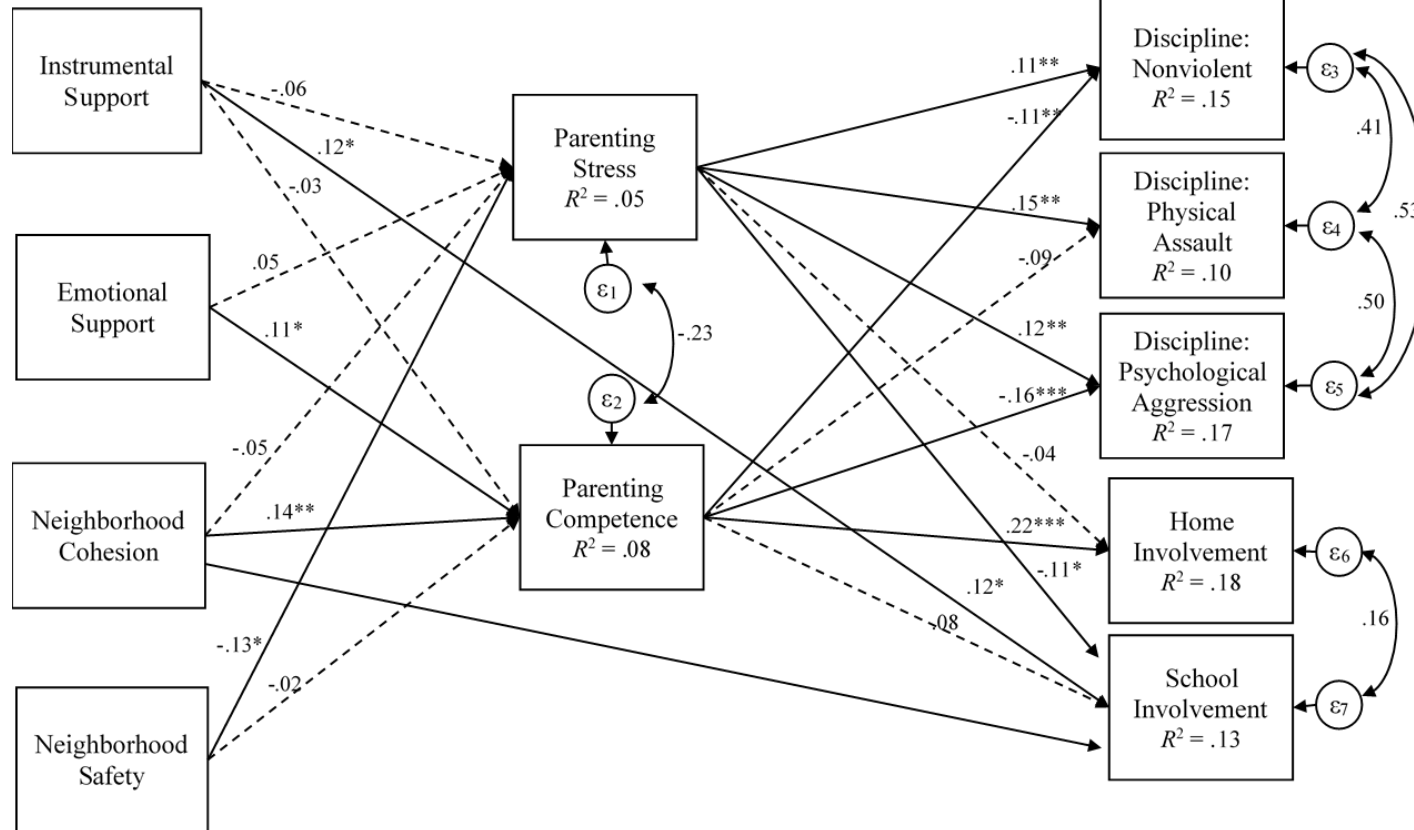


**Figure 3.2.** Structural model for the effect of interpersonal support and community resources on parenting perceptions and parenting behaviors

**Interpersonal Supports & Community Resources**

**Parenting perceptions**

**Parenting Practices & Involvement**



Notes.  $\chi^2(6) = 8.11, p = 0.230$ ; RMSEA = 0.028, 90% CI [0.00-0.07]; CFI = 0.997; SRMR = 0.007;  $R^2 = .463$ . N = 460; Non-significant paths between interpersonal and community resources and parenting practices/involvement are not pictured. Model controls for: child sex, child age, maternal age, maternal race/ethnicity, maternal education, maternal marital status, number of children in the home, and family income-to-poverty ratio.

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## **Chapter V. Conclusion**

Findings from this dissertation contribute to the literature base on child health and wellbeing in the context of maternal depression by focusing on depression occurring later in childhood, developing comprehensive models that include important contextual factors, and utilizing a strengths-based perspective to guide the analyses. This dissertation was framed by a resilience perspective, life course perspective, ecological systems theory, and family systems theory. Moreover, this work was grounded in the tenets of social work that promote using a strengths-based approach, which entails building upon the strengths and resources of the client to help improve and reduce the identified problems or challenges (Simmons, Shapiro, Accomazzo, & Manthey, 2016).

In summary, Paper 1 determined how other risk and protective factors mediated the relationship between maternal depression and child physical health outcomes later in childhood. Paper 2 identified five latent profiles of child physical health and psychosocial wellbeing and explored differences in profile membership by experiences of maternal depression. Finally, Paper 3 found differences in the maternal-child relationship for children with depressed mothers, and examined the protective factors supporting this important social bond. In doing so, this dissertation generated a more complete picture of health and wellbeing for children experiencing maternal depression. This discussion provides a brief summary of key findings, implications, and future directions for each paper, and then considers overall limitations and implications of the dissertation.

## **Chapter II: Child Physical Health Outcomes and Maternal Depression: Examining the Influence of Other Risk and Protective Factors**

Chapter II examined the associations between three aspects of child physical health and maternal depression. Initial analyses were consistent with previous literature indicating maternal depression was a significant risk factor for poor overall health, overweight, including obesity, and asthma (Gladstone, Beardslee, & Diehl, 2015; Goodman et al., 2011; Lampard, Franckle, & Davison, 2014; Turney, 2011). However, when controlling for sociodemographic characteristics, child health and health behaviors, maternal health factors, and the maternal-child relationship, only the relationship between child overweight and maternal depression remained significant. The association between child asthma and maternal depression was completely mediated by sociodemographic factors, and the association between poor overall child health was mediated by the maternal-child relationship. Finally, the results from Paper 1 identified important modifiable risk and protective factors influencing child physical health, including increased television viewing and fast food consumption as risk factors.

This study contributes to our understanding of how maternal depression impacts child health by developing comprehensive models examining three important physical health outcomes later in childhood that included multiple risk and protective factors. To date, most research examining the impact of maternal depression has focused on mental health outcomes, and those that do consider physical health outcomes often lack the inclusion of other contextual factors (Goodman et al., 2011; Lampard et al., 2014; Repetti, Taylor, & Seeman, 2002; Turney, 2011). Furthermore, the importance of the maternal-child relationship on child psychological and emotional wellbeing for children of depressed mothers has been well documented, yet this factor has rarely been considered when examining physical health outcomes (Gladstone, Beardslee, & Diehl,

2015; Goodman et al., 2011; Reuben & Shaw, 2015). Results from this study provide additional information regarding child physical health outcomes in the context of maternal depression, and have direct practical applications.

Findings suggest that screening in a primary care setting for maternal depression should continue throughout childhood. While the American Academy of Pediatrics recommends screening for maternal depression at well-child visits during the first year of life (Kerker et al., 2016; Mishina & Takayama, 2009), this study supports that screening should continue beyond one year. Many screenings within pediatric care setting take only a few minutes and could lead to higher rates of diagnosis and treatment for mothers experiencing depression, thereby lessening the negative impact on child physical health (Coiro, 2015; Kerker et al., 2016). To that end, with the increase of screening and identification of maternal depression, there must also be additional resources for mothers to get treatment. As such, findings highlight the importance of collaboration between child primary care settings with adult primary care and behavioral health care settings. Child primary care providers should have the ability and knowledge to refer mothers to behavioral health care settings, as well as provide support during child primary care visits. Thus, healthcare policy should reflect this need.

Finally, these analyses identified modifiable child health behaviors that impact child physical health in the context of maternal depression. Identified protective and risk factors should be used to inform the development of clinically tailored programs aimed at mitigating the risk associated with maternal depression and supporting good physical health in children. Practitioners and programs working with children of depressed mothers should specifically address modifiable risk factors related to health behaviors

(e.g. television viewing) and promote protective supports (e.g. healthy eating habits) when providing clinical interventions.

Finally, future analyses should continue to examine the pathways through which maternal depression impacts child physical health outcomes, particularly child overweight. Future research would benefit from exploring how the symptoms of maternal depression may impact parenting behaviors related to providing a healthy environment, like preparing healthy meals and providing opportunities for exercise. Furthermore, given the social determinates leading to poor mental and physical health outcomes (World Health Organization, 2014), future analyses should investigate how negative environmental factors may impact both depression in mothers and poor health outcomes for children, with the goal of identifying factors leading to heightened risk.

### **Chapter III: Latent Profiles of Child Health and Wellbeing in the Context of Maternal Depression**

Chapter III developed a multidimensional conceptualization of child health and wellbeing using multiple mother and child reported physical and psychosocial health indicators, and then explored differences based on experiences of maternal depression. These analyses identified five latent profiles of child physical health and psychosocial wellbeing, suggesting a divergence from the standard dichotomy of healthy and unhealthy. Rather, we found that in addition to the thriving (healthy) and at-risk (unhealthy) profiles, there were three other profiles that represented both risk and resilient functioning. One profile indicated risk related to a discrepancy in perceptions of health between mother and child, another indicated good physical health coupled with poor psychosocial wellbeing, and the last profile showed poor physical health and

struggling psychosocial wellbeing. Furthermore, we found that children of depressed mothers, while most likely to have thriving health, were at greater risk of being in all risk groups as compared to the thriving group, except for the discrepant group. Maternal depression was not associated with increased risk of being in the discrepant health profile. These findings are in line with the principles of resilience perspective, which suggests that individuals may experience both risk and resilience simultaneously (Liebenberg & Ungar, 2009; Masten, 2001; Masten, 2013). Moving from a unidimensional to multidimensional conceptualization of child health and wellbeing allowed for the identification of risk and resilience profiles in the context of maternal depression.

Most research in this area has utilized a top-down approach to explain how maternal depression impacts child health and wellbeing, rather than from a bottom up approach examining child adaptation, as a whole, in the context of maternal depression (Gladstone et al., 2015; Liebenberg & Ungar, 2009; Repetti et al., 2002; Reuben & Shaw, 2015). While it may seem like an inconsequential distinction, utilizing this approach generated important findings. Results suggest that practitioners should identify both positive and negative outcomes when designing clinical interventions. These interventions should be built on the identified strengths of the child while addressing any presenting problems. Importantly, these findings support the principles of social work practice, which recommends using a strength-based approach (Simmons et al., 2016) and encourage the use of screening tools, like the Child and Adolescents Needs and Strengths (CANS), that are designed to evaluate presenting strengths and risks (Cordell, Snowden, & Hosier, 2016).

These analyses generated important insight into child health and wellbeing in the context of maternal depression, and provide a roadmap for future analyses. These analyses suggest that when exploring child health and wellbeing, it would be beneficial to take into account the effects of multiple health indicators. In these analyses, only two indicators of positive health outcomes were included. As such, future studies should incorporate additional positive indicators of health and wellbeing, including measures of physical fitness, emotional regulation, and self-esteem. Furthermore, given that developmental needs change with age, it is important to examine different indicators of health and wellbeing throughout childhood that reflect developmental milestones. To that end, future research should examine the changes in child health and wellbeing profile membership across time, taking into account changes in maternal depression. Of note, the Fragile Families and Child Wellbeing (FFCWB) study is currently collecting data for a 15-year follow-up. These analyses should be replicated with these newer data. Finally, future studies should develop latent profiles of risk that include maternal depression and other risk factors, and then explore the impact on child health and wellbeing to determine the unique effect of maternal depression when coupled with other risk factors.

#### **Chapter IV: Resilience in the Maternal-Child Relationship for Mothers**

##### **Experiencing Depression**

Chapter IV investigated the influence of interpersonal supports and community resources on the maternal-child relationship, an important factor influencing child health and wellbeing, for mothers with depression. Findings indicated that mothers with depression were equally involved with her child at home, but were more likely to hold negative perceptions of parenting, suggesting that interventions should support mothers

in the management of their stress and appraisal of their competency. Finally, while interpersonal supports and community resources did not directly impact parent practices, they did influence perceptions of parenting. In turn, there was an indirect effect of these factors on parent practices and involvement. The maternal-child relationship is an important factor influencing child health and wellbeing. As such, it is important to consider the influence of external protective factors supporting this relationship.

This study contributes to our knowledge by identifying and exploring three aspects of the mother-child relationship, including perceptions of parenting, parenting practices, and parent involvement. Findings from this study have major implications in how we understand the ways in which mothers with depression parent their children. This study also extends the literature by utilizing a strengths-based approach to examine resilient functioning in the maternal-child relationship in spite of maternal depression, which has been rarely considered (Farmer & Lee, 2011; Feldman, 2007; van Doorn et al., 2016). The results also provide support for the ecological systems and resilience perspectives, in that interpersonal and community resources can act as protective factors for mothers with depression.

Results from this study should be used to inform early intervention and prevention programs, including community outreach programs that support child health and wellbeing, specifically for mothers with depression. As such, policy makers should support programs that focus on capacity building for mothers with depression. Intervention programs should highlight realistic parenting expectations, address how mothers appraise and manage their parentings stress, provide training for more adaptive parenting practices, and offer guidance in how mother should engage with her child.

Programs in primary care settings that provide psychoeducation regarding “typical” parenting stress, practices, and involvement could be important for mothers with depression.

Future studies in this area should consider how the quality of the maternal-child relationship impacts perceptions of parenting, parenting practices, and parent involvement. For instance, one may hypothesize that greater involvement may actually be worse if the maternal-child relationship is characterized by low levels of warmth and high levels of hostility. Furthermore, future research should consider the role of other family members. From a family systems and ecological systems perspective, a positive father-child or sibling relationship may mitigate the impact of a negative maternal-child relationship. Research in this area should continue to utilize a resilience perspective, which focuses equally identifying both risk and protective factors. Finally, a qualitative inquiry as to the ways in which depressed mothers see themselves as parents may provide important information that can be used to maintain a positive maternal-child relationship.

### **Limitations**

The primary limitations of this dissertation were related to the FFCWB data collection and measurement of key variables. First, data were not collected annually, limiting the ability to fully capture changes in maternal depression and child health and wellbeing. The FFCWB study conducted interviews at birth and 1-, 3-, 5- and 9-years after the baseline. Of note, the time between years 5 and 9 may represent an important transition for children, including the move from part time to fulltime school enrollment. This transition would likely affect both mother and child outcomes, as well as the maternal-child relationship. However, the FFCWB study represents one of the most

comprehensive longitudinal studies measuring multiple aspects of maternal depression and child health and wellbeing.

Second, there were some limitations in the availability and measurement of indicators. Maternal depression was measured in terms of the absence or presence of depression among a community sample of mothers without an indication as to symptom onset, severity, or chronicity. There was no indication as to whether onset occurred during the peripartum period, or if the mother had experienced depression prior to pregnancy and birth of the focal child. Furthermore, it is possible that depression occurring at a later age for the focal child may actually be peripartum-onset depression following the birth of a sibling. Additionally, indicators of symptom severity and chronicity were not available. There may be an assumption that the depressive symptoms may be less severe for the sample, as the mothers are functioning well enough to participate in a lengthy interview over multiple waves. As such, the results may not apply to mothers with severe depression. Nevertheless, the CIDI is a validated measure of depression (World Health Organization, 1994), and may be identifying a typical level of depression among mothers from a community sample.

Last, while the models include multiple empirically and theoretically supported variables, there is always a possibility that these analyses may not have included some important factors. For instance, these analyses included only a few indicators of positive health and wellbeing for children, and would benefit from the inclusion of additional positive indicators related to both physical health and psychosocial wellbeing, including healthy habits (e.g. exercise, wearing a helmet), physical fitness, self-efficacy, and emotional regulation. These factors were not available in the FFCWB public dataset.

Additionally, factors related to maternal warmth and hostility would be important to consider for future analyses. Finally, these analyses do not take into account the impact of other immediate and extended family members, which are important considerations for child health and wellbeing.

### **Implications**

Ensuring the health and wellbeing for our nation's children is a top social work and public health priority, and is one of the American Academy of Social Work and Social Welfare grand challenges (Hawkins et al., 2015). The findings from this dissertation have major implications informing these priority areas. Improving health and wellbeing in childhood extends beyond just bettering the lives of children to supporting health across the life course, thereby reducing the burden of disease and disorder in adolescence and adulthood (Rosenbaum & Blum, 2015). Importantly, these analyses were all focused on depression occurring later in childhood, suggesting that depression continues to play a role in child health and wellbeing well after the postpartum period. The result from these three papers highlight the continued need for depression screening and intervention throughout childhood. Often the prevention of negative outcomes in childhood is key in lessening the burden of disease across the life course (Hawkins et al., 2015).

More broadly, findings from this dissertation may have larger implications related to the stigma associated with maternal depression (Corrigan & Watson, 2002; Mickelson, Biehle, Chong, & Gordon, 2016; Reupert & Maybery, 2007). To date, most research in this area has been focused on establishing maternal depression as a risk factor. In doing so, the stigma associated with maternal depression may have been potentiated by the use

of a strictly deficit, risked-based approach, unintentionally increasing the negative perceptions of mothers with depression. Mothers with depression often report the fear of being seen as a bad mother and may not seek help, in part due to the stigma associated with parenting while experiencing mental illness, thereby increasing risk to her offspring (Coiro, 2015; Kingston et al., 2015; Mishina & Takayama, 2009). Maternal depression has the most detrimental effect on children when left unidentified and untreated (Coiro, 2015; England & Sim, 2009; Pratt & Brody, 2014). However, using a strengths-based approach that focuses on how children adapt in the context of risk may help provide a more balanced picture of how children experience maternal depression, thereby reducing stigma to mothers and her children. This dissertation balances the current literature base by examining the ways in which other contextual factors mediate the risk associated with maternal depression, identifying the potential for children to exhibit resilient functioning, and exploring how mothers maintain a positive relationship with her child in the context of maternal depression.

Finally, this dissertation provides a map for future important research directions. First, given the importance of early childhood experiences, longitudinal research methods should be employed to examine the cumulative effect of maternal depression on child health and wellbeing across the life course. Second, future research should focus on exploring the pathways through which maternal depression is associated with child health and wellbeing, including utilizing predictive models that take into account the temporal order of indicators and outcomes. Third, these analyses only focused on the mother-child dyad, yet many children are part of larger family systems that include other members, like fathers, siblings, and grandparents. To that end, future research should employ a

family systems perspective taking into account the impact of these family members on child health and wellbeing. Lastly, there is a growing demand for research considering contextual factors and utilizing a strengths-based approach. Employing a strengths-based approach when examining child health and wellbeing can advance the knowledge pertaining to factors that promote resilient functioning across the life course, and highlight the potential for children in the context of adversity, like maternal depression, to defy the odds.

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