Mental and Physical Health of Mothers and Children: Does Maltreatment Matter?

by

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Abstract

Maternal depression (MD) and physical health (MH) can have great impact on children, specifically children's internalizing, externalizing and physical health, but little research has examined how maltreatment and children's sex may affect maternal influences. The purpose of this study is to examine how MD and MH at child age 4 affects changes in internalizing, externalizing and physical health from age 4 to age 6, and whether the effects differ for maltreated males, maltreated females, non-maltreated males, and non-maltreated females. This study examines 598 children and mothers in a high-risk sample. Overall, MH predicts child physical health, but not child externalizing or internalizing and MD predicts child health, internalizing and externalizing. MD is related to child health for maltreated males, externalizing for maltreated and non-maltreated females, and internalizing for non-maltreated females and males. MH is related to child health and externalizing for maltreated females, and internalizing for maltreated males.

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Introduction

John Donne wrote the famous words "no man is an island," referring to our human need for interconnectedness. As his phrase stands true for adults, the words "no child is an island" may be even more pertinent. Children may have all of their physical needs met, but without the care of people surrounding them, children cannot thrive. Researchers have been studying the relationship between characteristics of parents and their children for decades. While genetics may explain some shared characteristics, the role of experience cannot be ignored. Most parents offer their children both genetics and home environment, one of the most influential factors in child development. The goal of this study is to examine how the influence of mothers on their children's development can go awry. What happens if providers of genetics and environment are incapacitated by poor physical or mental health? If parents are ill or depressed, this may help explain poor health and behavior problems in children. Even worse, if parents are unable to protect their children from abuse, children's health may suffer to a greater degree.

Attachment Theory (Bowlby, 1988) lends a valuable framework through which to understand maternal and child functioning. This theory focuses on the crucial attachment of children to primary caregivers. The necessary bond between mothers and children may be of lesser quality in high stress families because of marked conflict, aggression, and neglect (Repetti, Taylor, & Seeman, 2002). A systemic view would suggest that the stressors like mental health problems, physical health problems, or child maltreatment would influence both the individual mothers and children, and that the effects of these

stressors would be transmitted through mothers to children, putting all at risk for health problems. Although we do not have a measure of attachment in this study, viewing physical and mental health of parents and children through an attachment lens enables these important issues to be understood through a theoretical framework.

The health of parents and children are salient to both the broad level functioning of society and the focused level functioning of individuals in families. Being that parents are one of the largest influences in their children's development, when parents suffer from health concerns, children's development suffers also (Kahn, Zuckerman, Bauchner, Homer, & Wise, 2002; Mensah & Kiernan, 2011). When mothers are physically ill, they may not be able to attend to the needs of their children at the same level as healthy mothers. The medical and nursing fields have studied the role of parental health on child development, but human development and family studies can also add to this knowledge.

Like physical health, mental health can also debilitate mothers. For example, maternal depression has been repeatedly related to poor outcomes for children, such as internalizing problems and externalizing problems in childhood (Goodman, Rouse, Connell, Broth, Hall, & Heyward 2011; Middleton, Scott, & Renk, 2009; Mordoch & Hall, 2002; Nicholson, Deboeck, Farris, Boker, & Borkowski, 2011; Tompson, Pierre, Boger, McKowen, Chan, & Freed, 2010; Turney, 2011) and depression and poor emotional functioning in adulthood (O'Connell, 2008; Timko, Cronkite, Swindle, Robinson, Turrubiartes, & Moos, 2008; Weissman, Wickramaratne, Nomura, Warner, Pilowsky, & Verdeli, 2006). Almost half of the United States population report some form of mental illness or psychiatric disorder in their lives, with over half of those people being parents (Nicholson, Biebel, Hinden, Henry & Stier, 2001). Understanding the influence of parental mental illness on

children is a critical issue in today's society. With greater understanding, we can more effectively protect and nurture the development of children and help them become high-functioning contributors to society.

Along with the qualities of the parents, child development is also influenced by life events. Many children experience traumatic events, with child abuse and neglect being much too common traumata. Of 3.3 million referrals made in 2010, Child Protective Services in the United States conducted 1.8 million investigations of child abuse and neglect. Approximately 440,000 of those investigations led to a substantiated case of child maltreatment (US Department of Health and Human Services, 2011). As a result of trauma, children may experience many affective, behavioral, and cognitive symptoms. These include: fear, depression, anger, poor emotion regulation, avoidance of painful feelings or reminders of the event, emotional numbing, sexualized behaviors, substance abuse, self-injury, cognitive distortion, and irrational beliefs (Cohen, Mannarino, & Deblinger, 2006).

For victims of child abuse and neglect, 37.2% were abused by their mother alone, 18.5% by their mother and another perpetrator, and 18.5% by their mother and father (US Department of Health and Human Services, 2011). Poor mental and physical health of mothers can put children at higher risk of experiencing a traumatic event. The Center for Disease Control has taken a special interest in promoting mental health of women and girls. They emphasize specific risk factors influencing the health of women, particularly victimization by physical, psychological, or sexual abuse, witness of violence, and family members with mental, substance, or legal problems. While these serve as risk factors for difficulties in men and women, women appear to be at an even higher risk of adverse events than men. Children exposed to these negative circumstances are also more likely to

have emotional or behavioral problems in childhood. An intergenerational cycle occurs when adults who have had adverse experiences in childhood are more likely to have mental health difficulties throughout their lives, which in itself is a risk factor for their own children to have problems in childhood and adulthood. Early identification, prevention efforts, and treatment are crucial for stopping this cycle and helping children have healthy futures (Lesesne & Kennedy, 2005).

Mother mental and physical health may be related to the overall functioning of both parents and children. Stressors, which could include mental or physical health problems or episodes of maltreatment, create both physical and emotional reactions, which activate physiological responses in the body. These responses of the neuroendocrine system, if repeated chronically, weaken the ability to cope both physically and psychologically. This creates a cyclical relationship between mental and physical health, in which both aspects of health influence the other. Chronic social stress in the life of children can weaken their physiological abilities to regulate the body's stress response and maintain good health, a concept referred to as allostatic load (McEwan & Stellar, 1993). Therefore, individuals with chronic stress from unstable environments (possibly due to poor mental health of mothers, poor physical health of mothers, or child maltreatment) may have poor overall health because the energy for functioning is allocated to the physiological coping systems (Flinn, 1999). The physiological impact of maternal mental and physical functioning and the experience of child maltreatment put children at risk for later ill effects.

Potentially harmful physiological reactions are common for children with incapacitated mothers or who have experienced abuse. For example, cortisol is a chemical released in the body in stressful situations. When cortisol is released frequently over a length of time, this can

have a negative effect on the body. Energy that should be used for physical development goes toward psychosocial problems. In a study by Alink, Cicchetti, Kim, and Rogosch (2012), maltreated children had more physiological stress responses (release of cortisol) than non-maltreated children. Their poorer social and behavioral functioning moderates this relationship, such that by having more aggressive and withdrawn behaviors they had more cortisol releases over time. Flinn (1999) looked at children in a rural village in Dominica and found that family structure was associated with cortisol levels, such that children who live with a single mother (without kin), a step-father and half siblings, or distant relatives have higher coritsol levels than children living in a nuclear family, with a single mother and close kin, and with grandparents. Stress in different forms can increase physiological response, thereby putting people at risk for physical health problems. Because of this connection between stressful situations and physiological reactions, we will look at the effects of stress due to mothers' depression, poor health and maltreatment on children's physical health and negative behaviors.

To better understand the effects of maternal health and depression on child outcomes, longitudinal research in this area is needed. Using data from the Longitudinal Studies in Child Abuse and Neglect (LONGSCAN; see Runyan et al., 1998 for details) project, we examine the effects of maternal depression and poor health on changes in children's behavior and physical health in a high-risk sample over two years from child age 4 to age 6, and how this is different across male and female children who have and have not been abused.

Literature Review

Attachment Theory

As previously mentioned, Attachment Theory is an influential theoretical foundation for the investigation of maternal functioning's effects on children's functioning. We will not include actual measures of attachment in this study, but we felt that this theoretical foundation needed to be discussed to some extent. John Bowlby's studies of maternal deprivations brought to light the many poor outcomes of those children separated from their mothers. From studying children, he determined the importance of the presence of responsive caregivers. Attachment behavior is evoked in children by fear, pain, tiredness, and separation (physically or emotionally) from the mother (Bowlby, 1988). The way that parents respond to their children determines the quality of attachment. If caregivers are responsive and comforting on a consistent basis, children will learn to trust caregivers and become securely attached. However, not all caregivers are able to meet their children's needs in appropriate ways and thus attachment goes awry. If caregivers are responsive some times and not responsive other times, children will not be able to predict the trustworthiness of the caregiver and will be anxiously attached—seeking closeness and fearing loss of love. If caregivers are nonresponsive or rejecting, children will learn not to turn to their caregivers for comfort or to rely on others and instead will be avoidantly attached—avoiding vulnerability or closeness (Bowlby, 1989; Cicchetti, Toth, & Lynch, 1995). A fourth style of attachment is related to less predictable and coherent behavior

patterns. Disorganized attachment is the use of a variety of coping strategies, such as seeking closeness and then moving away or dissociation. If caregivers are associated with comfort at some times and pain at other times, children become confused and disoriented in how to seek comfort (Cicchetti et al., 1995). Attachment behaviors are not necessarily conscious, but influence behavior of children and adults on a daily basis from throughout the lifespan (Bowlby, 1989).

Maltreatment can have a lasting impact on attachment with most maltreated infants developing insecure attachment. In particular, inclusion of the disorganized category reveals that most of these maltreated children present as disorganized (Cicchetti et al., 1995). Comparing groups of preschoolers who have been maltreated to those who have not, more children in the maltreated group were insecurely attached and disorganized than the non-maltreated group, with mother-child relationships being markedly less positive (Stronach, Toth, Rogosch, Oshri, Manly & Cicchetti, 2011). Adults who have been maltreated in childhood have attachment related problems as well, with more negative views of self, more psychopathologies (Muller, Lemieux & Sicoli 2001), and more romantic relationship problems than those who were not abused (Colman & Widom, 2004). The quality of attachment is relatively stable over time due to the caregiver tendency to behave consistently in particular patterns. An internal working model is formed through the patterns of interpersonal interactions, however if significant changes in these interactions occur for the better, a deviant trajectory may become less so over time (Bowlby, 1989). In harmony with this concept of attachment as malleable, Cicchetti et al. (1995) emphasize attachment as a transactional process, not an inflexible characteristic.

In the transactions of the attachment relationship, poor physical health or depression may make the caregiver more inaccessible to the child. As children internalize the attachment relationship, parents who are chronically unavailable due to mental health or physical health problems are influential in children's negative views of the caregivers and of themselves (Cicchetti et al., 1995). Children of mothers with long-standing health difficulties, like chronic pain, tend to have more insecure attachment, more internalizing and externalizing behaviors, and poorer physical health than those children of healthy mothers (Evans, Keenan, & Shipton, 2007). The functioning of mothers has a critical influence over the functioning of children.

Attachment plays a role in determining both psychological and physical health. Infant attachment has been shown to be indicative of child emotional and behavioral outcomes up to 4 years of age. Secure attachment is related to positive outcomes throughout childhood and adulthood as well. Early attachment researchers suggested physical health is related to attachment quality, and while current researchers have begun to study this more in depth, more longitudinal research is needed (Ranson and Urichuk, 2008). In infants, attachment can influence the physiological stress reaction. A secure attachment can buffer heightened release of stress hormones, thus protecting the body from the negative influences of chronic stress (Ranson and Urichuk, 2008)—thus if a secure attachment is maintained through stressors like maltreatment, the physiologic stress reaction may be lessened in severity. Because chronic stress leads to poorer health outcomes and child maltreatment increases the likelihood of being insecurely attached, increasing the likelihood of poor health.

Attachment theory provides strong theoretical ground for the relationships between maternal depression, maternal poor health, child maltreatment, and poor child outcomes. Maternal characteristics and child life events are interwoven into children's ways of experiencing the world, or children's attachment models. When caregivers are not consistently responsive to their children, children may become insecurely attached. Insecure attachment is related to poorer biopsychosocial functioning. Thus, the importance of the mother-child relationship is highlighted through the lens of this theory.

Maternal Depression

Depression is related to many hardships in the lives of mothers. Blegen, Hummelvoll, and Severinsson (2010) conducted a literature review of 19 studies on mothers with mental health problems. These studies measured mental health with a variety of measures, with 13 including some type of interview. Other measures of mental health included the Diagnostic Interview Schedule, the Colorado Symptom Inventory, DSM-V criteria, Beck Depression Inventory, and Center for Epidemiologic Studies Depression Scale. They found that mothers with mental health problems face many challenges. They tend to live alone with their children. Parenting may serve as a source of insecurity, but also a source of purpose, particularly incentive to seek mental health care. Children of mothers with mental health problems appear to be at greater risk than other children for behavioral and emotional problems in their future, however, the question persists of whether the symptoms of the mental health problems or the environmental situations surrounding children of mothers with mental illness put children at risk. Mothers and their children also struggle with the stigmas associated with mental health problems and maintaining positive views of self. Overall, Blegen et al. (2010) summarizes the many

challenges that mothers with mental health problems such as depression face in their roles as mothers and as members of a society that views mental health problems as a weakness.

Mother and Child Mental Health

A solid body of research supports the importance of the relationship between mother and child mental health outcomes. In the field of nursing, Mordoch and Hall (2002) reviewed the literature on children living with parents with mental illness. Overall, children with parents who have mental illness face many challenges, with a higher risk for internalizing and externalizing disorders. They may face a stigma due to mental illness and tend to be raised in lower socioeconomic status' homes. Positive emotional bonds with parents and external support serve as protective factors for these children.

In particular, the relationship between maternal depression and child outcomes has been well studied. Goodman and colleagues (2011) conducted a meta-analysis on 193 studies investigating the relationship between maternal depression and child psychopathology. This review looked at child outcomes including internalizing problems (depression, anxiety, etc), externalizing problems (anger, aggression), general psychopathology, negative emotions or behaviors, and positive emotions or behaviors.

They found that the relationship between maternal depression and internalizing, externalizing, and child general psychopathology was statistically significant, but small in effect size. The relationship between maternal depression and internalizing problems was not stronger than the relationship between maternal depression and externalizing problems, despite depression being itself an internalizing problem. This may mean that a mechanism other than social learning plays a role in the relationship between maternal and child characteristics. Effect sizes were larger in younger children, suggesting that there

may be a sensitive period in which maternal depression is more influential on child psychopathology. Maternal depression has a stronger association with internalizing symptoms in girls than it does with internalizing symptoms in boys. The difference between girls and boys is not apparent with externalizing symptoms. When families are living in poverty, the effect size for maternal depression and child outcomes is stronger. Overall, when a large number of studies were examined together, the poorer outcomes of children with depressed mothers were evident.

Additional research has found similar effects of maternal depression on child outcomes. Turney (2011) examined this relationship using the Fragile Families and Child Well-being Study to look at children approximately 5 years old. Children with depressed mothers were more likely to have internalizing and externalizing problems. In addition, when controlling for SES, the relationship between depressed mothers and child outcomes remained. It appears that boys are at a higher risk for internalizing and externalizing when mothers are depressed than girls. Grace, Evindar, and Stewart (2003) found similar results in their literature review of postpartum depression and the influence on children's behavior. After reviewing studies, authors found postpartum depression is related to poor child behavior up to 5 years of age, although less so when reporters are the teachers rather than the depressed mothers. The effect of postpartum depression on behavior may be stronger for boys than for girls. However, they suggest that recurrent depression may be more salient to child functioning than postpartum depression.

Nicholson, Deboeck, Farris, Boker, and Borkowski (2011) used dynamical systems to model time continuously, looking at interplay between mothers and children psychopathology over time from age 3 to 10. They measured maternal depression using

the Beck Depression Inventory and child internalizing and externalizing Child Behavior Checklist (CBCL). They found that mothers' depressive symptoms have an effect on children's internalizing and externalizing symptoms at age 3, 5, 8, 10, such that when mothers' symptoms increase or decrease over time, children's symptoms change in the same direction. The influence of children on their mothers was not as strong. This suggests that systemically focusing on the mothers' mental health in interventions may be more fruitful than focusing solely on the children.

Poor mental health appears to have a cyclical effect, such that depression appears to be passed from generation to generation. Weissman et al. (2005) examined grandchildren, parents, and grandparents and found children in families with two generations of major depression are at an especially increased risk of anxiety disorders. Children with a depressed grandparent and a depressed parent are at the highest risk for psychopathology. While the mechanism of transmission is not certain from this study, the experience of being parented by depressed parents seems to put children at high-risk for being depressed.

Although we are not able to directly study parenting in this paper, the way that parents interact with their children is related to their mental and physical functioning. Many studies integrate the contribution of parenting into their analysis, perhaps as the means by which psychopathology is linked from parents to children. A literature review by Berg-Nielsen, Vikan, and Dahl (2002) made the case that parent psychopathologies such as depression are stressful experiences that influence parenting. Overall, parent mental health problems may influence the way that parents relate to their children, which in turn could influence child internalizing and externalizing. They suggest that negative and overly

controlling parenting relates to child depression and anxiety, while inconsistent parenting and poor monitoring lead to conduct problems.

Kahng, Oyserman, Bybee, and Mowbray (2008) studied a clinical sample of mothers with children between ages of 4 and 16. Parental psychiatric symptoms were associated with parenting, with higher level of symptoms being associated with more parenting stress and less nurturance. A change in symptoms over 5.5 years was related to a change in parenting, such that as mental illness improved, parents felt less stressed in parenting and more nurturing. Considering demographics and social context lessened the strength of the relationship, however, the effect of symptoms on parenting was still significant. The symptoms of depression experienced by depressed mothers may influence the internalizing and externalizing symptoms in their children evoked by their interactions.

Whether or not parenting is studied, maternal depression has been found to relate to child behavioral functioning repeatedly. Pfefferle and Spitznagel (2009) found that poor maternal mental health is associated with increased children's mental health services usage, with and without considering maternal aggravation as a factor. Middleton et al. (2009) found that mothers' depression was correlated with their ratings of internalizing and externalizing problems in children. They also analyzed these relationships in a regression and found that mothers' depression predicted externalizing problems in children, but not when controlling for parents' limit setting. Tompson et al. (2010) found associations between youth psychopathology at ages 8-12 and maternal depression and maternal expressed emotion. A history of maternal depression was associated with high maternal expressed emotion, and combined maternal depression and maternal expressed emotion were associated with children's reports of own depressive symptoms. Current

maternal depression was associated with maternal report of children's CBCL internalizing scores. History of maternal depression, current maternal depression, and maternal expressed emotion were associated with CBCL externalizing and Total Problems scores. Riley et al. (2009) investigated maternal depression and child outcomes in low-income families using multiple raters of child problems. They found emotional and behavioral problems in children were not different between children of mother with and without depression when rated by teachers, but were different by mothers' and fathers' ratings. Adjustment problems were found in children of depressed mothers whether rated by mothers, fathers, or teachers.

The relationship between maternal depression and children's mental health functioning continues in younger childhood through latency age. Using predictive correlations in a sample of mothers and daughters, Loeber, Hipwell, Battista, Sembower, and Stouthamer-Loeber (2009) found that multiple mental health problems for mothers are associated with multiple child mental health problems. Co-occurrence between mother and child mental health problems was significant from years 7 to 9 for conduct disorder, from 9 to 11 for depression, and from 9 to 11 for somatic problems.

The negative impact of having a mentally ill mother can be seen in adulthood as well. O'Connell (2008) conducted a retrospective study and found that while most adult children were functioning well, over half experienced depression in their adulthood and described their childhoods as painful and disruptive. In a 23-year study by Timko et al. (2008), adult children of depressed parents were lower functioning both emotionally and physically than adult children of non-depressed parents. In childhood or adulthood, children of depressed mothers experience long-term ill effects.

Mother and Child Physical Health

Fewer studies have been conducted on the relationship between the physical health of mothers and their children in Western societies. Using data from the Center for Disease Control, Pastor and Reuben (2011) found that child health status is related to maternal health status, such that the children of mothers with worse health status had poorer health conditions and outcomes than the children of mothers with better health status. Another study conducted by Evans, Keenan, and Shipton, (2007) found that children with mothers in chronic pain have poorer physical health than children with healthy mothers. While few human development studies have looked at physical health in mothers and children alone, many studies have examined both physical and mental health together.

Relationship between Mental and Physical Health

Mental health and physical health are closely related. Pinquart and Shen (2011) conducted a meta-analysis including 340 studies of children with chronic health problems and found that children with chronic illnesses like fibromyalgia or migraines are more likely to have depressive symptoms than children without chronic health conditions. Meuret, Ehrenreich, Pincus, and Ritz (2006) examined a sample of children in a clinical setting and found children with asthma have higher levels of internalizing problems than children without asthma. However, the parents of these children did not differ on their levels of internalizing disorders. Thus, without considering the influence of the parent, physical health problems seem to be associated with mental health difficulties.

While children with chronic illnesses are at risk for depressive symptoms, children with mental health problems are more likely to experience chronic health problems, as well. Combs-Orme, Heflinger, and Simpkins (2002) conducted a meta-analysis of studies

investigating this relationship. In low-income samples, children with serious mental health problems are more likely to also have chronic health conditions than children with no mental health problems.

Examining Mental and Physical Health of the Mother and Child Together

Because of the close link between mental and physical health, examining the influence of maternal mental and physical health on child mental and physical health within the same study is important. In the first 3 years of children's lives, when children are most dependent on mothers, mothers may have critical influence over the mental and physical health of children. Kahn, Zuckerman, Bauchner, Homer and Wise (2002) examined the effects of maternal health in early childhood. In a longitudinal study following children from birth to age 3, these researchers found that maternal poor physical health and depressive symptoms are related to poor child health and behavior problems. The more persistent the maternal problems over time, the more at risk the children's health. These young children of depressed mothers are also receiving less preventative health care and more acute medical treatment (Minkovitz et al., 2005). If children are experiencing these problems in the first 3 years of life, they will likely experience these problems at age 4 and beyond.

Mensah and Kiernan (2011) studied maternal health and children's behavior in the early years in a longitudinal study in the UK. They found that maternal physical health and psychological distress are related, and mother's health is related to their engagement and caregiving for the child. Maternal physical health predicted behavioral difficulties at age 5. This relationship was not as strong when controlling for psychological distress, but

remained significant. Persistent health problems had the strongest effect on child outcomes.

Severe physical illness of parents seems to influence the emotions of children, without considering parental mental health. Osborn (2007) reviewed 10 studies on the influence of early parental cancer and functioning in children. They found that while children of cancer patients are not at higher risk of serious psychosocial problems in comparison to children of healthy parents, they are at heightened risk of general internalizing problems. This seems to suggest that children may experience adjustment problems as a result of parents having a life-threatening illness, but children of mothers with non-life-threatening health conditions also suffer. Maternal chronic pain is linked with poorer outcomes. As mentioned earlier, children of mothers with chronic pain have poorer physical health. They also have higher rates of insecure attachment, more internalizing behaviors and more externalizing behaviors than children with healthy mothers (Evans, Keenan, & Shipton, 2007). Serious and less threatening health problems are related to the biopsychosocial functioning of children.

Maternal characteristics like depressive symptoms can have an impact on child physical and mental health for many years, even into adulthood. Weissman, Wickramaratne, Nomura, Warner, Pilowsky, and Verdeli (2006) followed a group of "children" age 6-23 with at least one depressed parent, and found these children are at a higher risk of mood and anxiety disorders, with effects lasting up to 20 years. These differences between groups are also evident in regards to medical illnesses, with adult children of depressed parents having more medical illnesses than those of non-depressed parents at the 20-year follow-up.

In addition to direct effects, maternal functioning can influence less direct determinants of child functioning. Casey et al. (2004) examined the influence of maternal depression on family resources in addition to influences on child physical health. Maternal depression is associated with welfare change, food insecurity, fair/poor child health, and child hospitalization. Propper, Rigg, and Burgess (2007), examining a birth cohort in the United Kingdom, looked at family income as an additional variable to child and maternal health. Mother's health and behaviors (smoking, working, diet fed to child, and housing before age 4) were associated with child's health from 6 months through 7 years of age. Maternal mental health is related to child health measures, except for body mass index. Low income predicted child health, however, family income was no longer strongly related to child health after controlling for mother's health, except for on the measure of children's body mass index. While one cannot ignore the effects of maternal functioning on child health, family factors like household income play some role in child development and should be considered as a control variable.

Social environments plagued by aggression or neglect that one might expect if mothers are depressed, ill, or distressed by lack of resources can have negative consequences for child well-being. Repetti et al. (2002) reviewed the literature on high-stress families and their social resources, and examined these variables' influences on child mental and physical health. Their review found that families that are considered to be highly stressed, that is families in which many members are conflicted, angry, cold, and neglectful, are related to poor mental and physical health development of children. Growing up in high-stress or "risky" families leads to physiological and neuroendocrine dysfunction in children and is associated with poor health-related behaviors in later

childhood (smoking, drug abuse, sexual promiscuity). In addition, the characteristics present in risky families are related to poor emotion processing in children. High-stress environments due to maternal depression or health problems are obviously detrimental to optimal health in children, as is the occurrence of high-stress created by negative life events.

The attachment relationships between mothers and children that help regulate emotions and physiological reactions may explain the link between mother and child health, but learned behaviors may also play a part. According to social learning theory, children learn from observing their environment, with parents being models for behavior and emotions. Children may observe their mothers being depressed, anxious, or angry and then act in similar ways. This same learning would occur for health related behaviors, such that children who see their mother taking care of their physical health will also take care of their health. Children may also learn from their parents that if they behave in certain ways, such as being anxious or defiant, they receive desired consequences (e.g. love, attention, etc), thus reinforcing these behaviors (Bandura, 1977). Having a depressed or unhealthy mother may create learned problems for children, as well as attachment injuries.

Risk Factors and Consequences of Child Maltreatment

Child maltreatment and the negative effects on children are more prevalent in families with certain vulnerabilities. Child maltreatment is associated with many risk factors, particularly many related to characteristics of the mothers. For example, in a study of low-income families with children under the age of 12, Kohl, Jonson-Ried, and Drake (2011) found that children of mothers with mental illness, particularly those with mood and anxiety disorders, are at higher risk of being reported for child abuse and are reported

more quickly than those without mentally ill parents. Li, Godinet, and Arnsberger (2011) used LONGSCAN data to examine protective factors among high-risk families from when their children were 4 to when they were 8. Irregular attendance of day care, maternal history of childhood maltreatment, total number of negative life events, mother having less than 12 years of education, single mother status, and low social support predicted reports of child maltreatment. However, maternal depression and psychosomatic symptoms were not significantly associated with maltreatment reports. While maternal mental illness is a risk factor for children, mothers with mental illness are not hopeless. Mullick, Miller, and Jacobsen (2001) found that in a sample of mothers with severe mental illness who lost custody of their children, insight into mental illness was associated with sensitive mothering and lower assessment of maltreatment risk.

The influence of abuse may be more salient at critical time periods for children (Keiley, Howe, Dodge, Bates, & Petit, 2001). Keiley et al. (2001) followed a community sample of 585 preschool boys and girls through 8th grade. Mothers reported physical maltreatment, and parents and teachers reported internalizing and externalizing behaviors using the CBCL and the Teacher Report Form (TRF), respectively. Using structural equation growth modeling, they found that maltreatment before the age of 5 was related to more negative symptoms than maltreatment at later ages. In a previous study using LONGSCAN data, Kotch et al. (2008) found that neglect at age 2 or earlier was the strongest predictor of aggressive behaviors as measured by the CBCL subscale at age 4, 6, and 8, compared to abuse at age 2 or earlier and abuse or neglect after age 2. Overall, earlier abuse tends to be associated with most difficulties in childhood.

Another study using data from one of LONGSCAN's sites found that behavioral problems might not be immediately evident in maltreated children. While maltreated and non-maltreated child had similar anxiety/depression, attention problems, and aggression at age 4, maltreated children had more growth in their anxiety/depression and attention problems through age 10 (Thompson & Tabone, 2010). Sexual abuse, in particular, may have long lasting negative consequences for mental health. Hillberg, Hamilton-Giachritsis, and Dixon (2011) conducted a meta-analysis in which they found that sexual abuse experienced in childhood is a risk factor for mental health problems in adulthood. The experience of maltreatment appears to be detrimental over the life course.

Exposure to a trauma can also increase physical health problems (D'Andrea, Sharma, Zelechoski, & Spinazzola, 2011). Flaherty et al. (2006), using the LONGSCAN dataset, found that one adverse trauma exposure almost doubled the risk of overall poor physical health and four exposures almost tripled risk of illness requiring medical attention. Maltreatment also increases the risk for health problems requiring medical attention in later childhood (Lanier, Jonson-Reid, Stahlschmidt, Drake, & Constantino, 2010).

As previously mentioned, maltreated children tend to have more physiological stress responses than non-maltreated children, moderated by social functioning with peers (Alink et al., 2012). Good emotion regulation improves peer relationships in maltreated children, therefore making them less likely to have pathologic behaviors (Kim & Cicchetti, 2010). In addition to maltreated children experiencing higher physiological stress on multiple measures and poorer psychological functioning, these same children experience more physical health problems than their non-maltreated counterparts (Rogosch, Dackis, &

Cicchetti, 2011).

Relationship between Mother and Child Health Influenced by Trauma

While maternal and child health is often strongly related, the experience of maltreatment is likely to have an influence on both children and mothers. Flaherty et al. (2006) also found that maternal depression is prevalent in 1/3 of caregivers of trauma-exposed children. A subject of interest is whether this depression is present before the children's trauma or whether the depression is related to the stress of parenting a child exposed to trauma.

The influence of maternal health may be different for maltreated and non-maltreated children. In a study conducted in Japan, Takei, Yamashita, and Yoshida (2006) found that general health scores were higher for mothers in a group of children who have been abused than those for mothers in the comparison. In the comparison group, the child's internalizing and externalizing scores were not related to the mothers' general health. In the abused group, children's behavior problems and mothers' somatic symptoms were associated. There was no relationship between teacher's report of behavior problems and maternal health, suggesting that teachers have a different view of children's functioning than parents.

Maternal functioning may have a particularly pertinent influence on children who have been sexually abused. Kelly, Faust, Runyon, and Kenny (2002) examined behavior problems in sexually abused children of depressed and non-depressed mothers. Depressed mothers rated their children higher on conduct disorder, social aggression, attention problems or immaturity, and psychotic behavior. Children of depressed mothers had higher depression scores, although these scores still tended to be within a non-clinical

range. While child delinquent behaviors are related to mother's depression in abused children (specifically sexually abused children), this association may be partially explained parental support following abuse (Rakow, Smith, Begle, & Ayer, 2011). A parent suffering from depression or health problems may be less capable of providing adequate support after such a traumatic event.

Sex of the Children

The effect of sex is often overlooked as a predictor or moderator in the research on maternal depression and health on child outcomes, and the findings of those studies that do examine sex are mixed. Some studies show that boys are at higher risk than girls for internalizing and externalizing problems when mothers are depressed (Grace, Evindar, & Stewart, 2003; Turney, 2011). However, in a meta-analysis of 193 studies by Goodman and colleagues (2011), girls display more internalizing symptoms than boys when mothers are depressed. There was no difference for externalizing symptoms. Our study will explore the possible differential effects of mothers' depression and health on child outcomes for males (maltreated and non-maltreated) and females (maltreated and non-maltreated).

Environmental and Social Factors

Maternal and child functioning may be influenced by a variety of factors: from individual characteristics to the relationship system to environmental forces. The smaller subsystems of parent-child dyads and individuals are embedded in the larger system of a cultural group or social class. A community can have influence over how a mother relates to her child. There are varying levels of importance on the protection and value of children in different communities and cultures (Earls & Carlson, 2001). Thus, child maltreatment (by Child Protective Services standards) may be more prevalent among communities in

which the protection of children is emphasized less or, more likely, in communities or social classes where protection is less possible due to other constraints (e.g. no available childcare due to low financial resources, etc). Thus, income, ethnicity, and marital status are important control variables in this study.

Personal relationships face more challenges when economic and social stressors are present. When resources are low, mothers struggle to be ideal caregivers and children face more danger of maltreatment (Bolger, Thomas, & Eckenrode, 1997). Without the support of caring partners, mothers face even more hardships. In a study conducted in the United Kingdom, Cooper et al. (2008) found that single mothers are significantly more likely to have common mental disorders than other women, even when controlling for age, income, and social support. When resources are low, mothers and their children are at-risk.

Rather than a linear association between one cause and poor outcomes in children, a cumulative effect of negative influences in the child's life is possible. MacKenzie, Kotch, Lee, Augsberger, and Hutto (2011) explored cumulative risk, with a focus on outcomes in children who have been maltreated. They gave a risk index score based on the risk factors of "(1) minimal maternal education, (2) large family size, (3) family structure, (4) maternal age, (5) maternal childhood history of abuse, (6) any social assistance, (7) low family income, (8) maternal depression, (9) low maternal self-esteem, and (10) unsafe neighborhood" (p. 2394). They found that early maltreatment is related to internalizing and externalizing problems at age 4. When controlling for cumulative risk, the strength of the prediction decreases, however early maltreatment continued to be a significant predictor at 4 years of age. This prediction does not remain at age 6, 8, and 10. However, at age 10, cumulative risk does predict internalizing and externalizing problems.

To examine this in a different way, MacKenzie et al. (2008) used between groups growth trajectories from age 4 to 12. They examined four groups: high-risk reported for maltreatment, high-risk non-reported, low-risk reported, and low-risk non-reported. High-risk children had poorer functioning than low-risk children, and within both the high- and low-risk group, children with reports of maltreatment were poorer functioning than those without reports. This suggests that child maltreatment is not the mechanism for poor outcomes in children, but rather a complex combination of multiple factors should be considered.

Based on the literature, we hypothesize that maternal depression and poor physical health when children are 4 will predict change in child physical health, internalizing behavior, and externalizing behavior from age 4 to 6. We also hypothesize that the effect of mothers' health and depression when the children are 4 will have a greater effect on change in maltreated children's health and behavior problems from age 4 to age 6, than will these same effect for non-maltreated children. In addition, these effects may also differ by the sex of the child.

Methods

Data for this study was collected as part of the Consortium of Longitudinal Studies in Child Abuse and Neglect (LONGSCAN) project. LONGSCAN is a longitudinal study examining child maltreatment effects in high risk samples. They followed children from the early years of life through adolescence across the United States. Data were collected by interviewer administered paper and pencil testing and record collection from Child Protective Services and state Central Registry. We will be conducting a secondary data analysis on this dataset.

Participants

This study follows 598 children and their biological mothers over two years, from age 4 to 6. This sample has been selected out of the larger project sample based on the caregiver being the biological mother. Participants were recruited as caregiver-child dyads from 5 sites across the United States, located in the East, Midwest, South, Southwest, and Northwest. Each site used slightly different enrollment strategies. The Southwest site focused on children placed in foster care before age 3.5 years, thus only the children returned to their biological families where the mother was the respondent will be included from this site. The Northwest site focused on children with CPS reports. The Midwest and South sites contained one group of participants with CPS reports and matched comparison groups. The East site focused on low-income children with varying levels of risk of maltreatment.

The majority of this sample is made up of racial minorities, with 57% of mothers being African American (*n*=338). Mothers' education ranges from 4 to 20 years, with an average of

12 years of education. The average age of mothers is 30 years. Of the mothers in the sample, 78% are single mothers (*n*=466). The majority of the families are low-income households, with 82% making less than $20,000 per year (*n*=445). Of the children in this sample, 53% are female (*n*=318). Forty-five percent of our sample experienced at least one type of maltreatment at age 4 or earlier (*n*=268). Of those who were maltreated, 54% were female (*n*=145) and 46% were male (*n*=123). We will be able to examine differences in the proposed model for maltreated and non-maltreated children. But, because we have a large sample, we will also be able to examine difference by gender across maltreatment and non-maltreatment: males who have not been maltreated (*n*=157, 26%), males who have been maltreated (*n* =123, 21%), females who have not been maltreated (*n* =173, 29%), and females who have been maltreated (*n*=145, 24%).

Measures

Maternal Variables

Mothers' physical health is measured at child's age 4 by a project developed, one-item global health self-report rating. Mothers answered the question, "Compared to others your age, would you say that your health is ...?" The four categories of health are poor, fair, good, and excellent. The variable is recoded so that excellent health = 4 and poor health = 1. Krause and Jay (1994) describe global health measures as a reliable and appropriate physical health assessment.

Maternal depression is measured at child's age 4 by the Center for Epidemiologic Studies Depression Scale (CES-D) developed by Radloff (1977). This self-report measure is composed of 20 items reflecting depressed mood, feelings of guilt, worthlessness, helplessness and hopelessness, and somatic symptoms such as psychomotor retardation, loss of appetite,

and sleep disturbance. Items are rated on a 4-point scale based on frequency, with 0 for rarely or none of the time to 3 for most or all of the time. Scores range from 0 to 60, with a score of 16 commonly used as a cut-off for high scores determined by Radloff (1977). The CES-D is a reliable measure and for this study Cronbach's alpha is .90 at age 4. Radloff (1977) has also established concurrent and construct validity of the CES-D as a measure of depressive symptoms.

Child Variables

Children's Global Physical Health Children's physical health is measured at age 4 and 6 by a project developed, one-item global health parent-report rating. Mothers answered the question, "Right now, how would you describe child's health compared to other children his/ her age?" The four categories of health are poor, fair, good, and excellent. The variable is recoded so that excellent health = 4 and poor health = 1. Like mothers' physical health measure, children's global health status has been found to be valid and reliable (Krause & Jay, 1994).

Child emotional/behavioral problems were assessed at age 4 and age 6 using the Child Behavior Checklist (Achenbach, 1991). This study looks at both the Internalizing and Externalizing scores of the CBCL. The Internalizing Problems subscale is made up of 33 items, with possible scores ranging from 0 to 62, and includes the CBCL scales of Social Withdrawal, Somatic Complaints, and Anxiety/Depression scales. The Externalizing Problems Subscale is 33-items, with possible scores ranging from 1 to 66, and includes scales of Delinquent Behavior and Aggressive Behavior. This 113-item measure is scored from 0 to 2 (0=not true, 1=somewhat true, and 2=very true or often true) and is based on observed behaviors over the past 6 months. The CBCL has been shown to have internal and test-retest reliability

(Achenbach, 1991), with a reliability coefficient of .88 established by the originator (Maruish, 1999). For this study, Cronbach's alpha is .81 for the total CBCL and the CBCL subscales range from .46 to .93, with Externalizing having an alpha of .93 in ages 4-11 and Internalizing's alpha not being listed. Many studies have shown that the CBCL is valid and scores are compatible with psychiatric diagnoses (Achenbach, 1993, Edelbrock & Costello, 1988; Rey & Morris-Yates, 1992). This frequently used measure will provide a glimpse of the internalizing and externalizing problems experienced by children.

Maltreatment

This study defines maltreatment as any allegation of physical abuse, sexual abuse, or neglect made at age 4 or earlier, as reported by Child Protective Services. We used allegations rather than substantiations based on findings from Hussey, Marshall, English, Knight, Lau, Dubowitz, and Kotch (2005) that outcomes in children with substantiated reports and unsubstantiated reports had no significant differences in behavioral and emotional outcomes over time from age 4 to 8. In Litrownik's (2009) presentation on LONGSCAN data use, he suggests using allegations of abuse in analyses. Overall, 45% of our sample experienced at least one type of maltreatment at age 4 or earlier (n=268). Within the sample, 17% have been physically abused (n=103), 7% have been sexually abused (n=40), and 39% have been neglected (n=236). We control all analyses for marital status, age of mother, education, income, and ethnicity.

Analysis Plan

We first fit a main effects model allowing mother's health and depression at age 4 to predict changes in child health, externalizing behavior and internalizing behavior from age 4 to 6. Then we tested the moderation of the main effects by maltreatment and sex

simultaneously using a multiple group analysis with four groups using Mplus software (Version 6; Muthen & Muthen, 1998-2010). Missing data were not imputed; rather, available data from all 598 children were used in analyses by using full information maximum likelihood (FIML) estimation with robust standard errors. FIML estimation is one of the best methods of dealing with missing data (Acock, 2005). Model fit was assessed by a χ^2 statistic/degrees of freedom ratio less than 5 and a RMSEA less than .10 (Wheaton et al, 1977).

Results

Descriptive Statistics

Univariate analyses were conducted for descriptive statistics of all variables used in this study. The descriptive statistics for both the main effect group and the groups determined by maltreatment status and gender for predictors and outcomes are presented in Table 1a, while the descriptive statistics for controls are presented in Table 1b. All variables are fairly symmetrically distributed, except for maternal depression. Maternal depression was skewed towards lower values, thus we logged this variable to create a more normal distribution for use in further analyses.

Bivariate Analysis

Pearson correlations were estimated between all the variables used in this study. Results are presented in Table 2. Variables followed from age 4 to age 6 are all significantly and positively related across time, such that child health at age 4 is moderately correlated with child health at age 6 (r =.32, p < .001), child externalizing at age 4 is largely correlated with child externalizing at age 6 (r =.65, p < .001), and child internalizing at age 4 is largely correlated with child internalizing at age 6 (r =.60, p < .001).

Within the predictors and outcomes, most variables are at least marginally correlated. For child variables, child health at age 4 is marginally, negatively correlated with child externalizing symptoms at age 4 (r =-.09, p < .10), externalizing at age 6 (r =-.10, p < .10), internalizing symptoms at age 4 (r =-.09, p < .10), and internalizing age 6 (r =-.10, p

< .10). Child health at age 6 is more strongly related to most of these variables, such that child health at age 6 is significantly associated with child externalizing at age 4 (r =-.13, p < .05), child internalizing at age 4 (r =-.17, p < .01), and child internalizing at age 6 (r =-.19, p < .001). The correlation between child health at age 6 and child externalizing at age 6 is negative and marginally significant (r =-.09, p < .10). This suggests that poor child health is associated with child behavioral problems.

Child internalizing and externalizing symptoms are also correlated. Child internalizing at age 4 is largely correlated with child externalizing at age 4 (r =.66, p < .001) and moderately correlated with child externalizing at age 6 (r =.41, p < .001). Child internalizing at age 6 is moderately correlated with child externalizing at age 4 (r =.45, p < .001) and highly correlated with child externalizing at age 6 (r =.63, p < .001). This is important for later analysis, given that we are examining both internalizing and externalizing simultaneously. Children with high externalizing problems have high internalizing ones as well, and vice versa.

For the main maternal variables, mother depression and mother health are moderately, negatively correlated (r =-.33, p < .001), such that higher levels of depression are associated with lower levels of physical health. Mother variables are also significantly related to child variables. Mother depression and child health at age 4 are negatively and significantly correlated (r =-.16, p < .01). Mother depression and child physical health at age 6 are negatively correlated (r =-.23, p < .01). Mother depression and child externalizing are moderately correlated at both age 4 (r =.30, p < .001) and age 6 (r =.33, p < .001). Mother depression and child internalizing are moderately correlated at both age 4 (r =.34, p < .001) and age 6 (r =.37, p < .001). This means that high levels of maternal depression

high levels of externalizing problems exist in children, as well as highlevels of internalizing, and poor child health, and vice versa. Mother physical health and child health at age 4 are positively correlated (r =.14, p < .01). Mother physical health and child physical health at age 6 are positively correlated (r =.15, p < .01). Mother physical health and child externalizing are negatively correlated at both age 4 (r =-.12, p < .05) and age 6 (r =-.12, p < .05). Mother physical health and child internalizing are negatively correlated at both age 4 (r =-.11, p < .05) and age 6 (r =-.13, p < .05). At low levels of maternal health low levels of child health, high levels of externalizing, and high levels of internalizing problems exist, and vice versa. The association between mother variables and child variables is important in establishing basic relationships for additional investigation through more sophisticated analyses.

The moderators of child gender and maltreatment status have fewer significant correlations with other variables. Child gender is negatively correlated with child externalizing at age 6 (r =-.13, p < .05), such that being male is related to higher externalizing scores at age 6. Child gender is also significantly and positively correlated with the control variable ethnicity (r =.15, p < .01), such that in this overall sample, being female is associated with being African American. In the full sample, maltreatment status is negatively correlated with child externalizing at age 6, such that being maltreated is related to lower externalizing scores at age 6 (r =-.17, p < .01). Maltreatment status is also positively correlated with the control variables mother age (r =.32, p < .001) and ethnicity (r =-.26, p < .001), such that being maltreated is associated with having an older mother and being an ethnicity other than African American.

Some control variables are correlated with predictor and outcome variables. Mothers' years of education is negatively correlated with mother depression (r =-.18, p < .001). Ethnicity is negatively correlated with child externalizing at age 6 (r =-.13, p < .05) and child internalizing at age 6 (r =-.14, p < .01), as well as having a marginally significant negative correlation with child internalizing at age 4 (r =-.09, p < .10). Meaning, being African American is related to lower levels of internalizing and externalizing symptoms. Ethnicity is positively correlated with mother health (r =.16, p < .01), such that being African American is associated with having a higher rating of health. Single marital status is marginally correlated with mother depression (r =.09, p < .10). Income is negatively correlated with mother depression (r =-.18, p < .001), such that having lower income is associated with maternal depression. Income is marginally correlated with mother health (r =.10, p < .10), such that higher income is associated with better health.

Some control variables are correlated with other control variables. Mother age is positively correlated with years of education (r =.21, p < .001), with being older associated with having more education. Single marital status is negatively associated with mother years of education (r =-.16, p < .01) and mother age (r =-.14, p < .01), with being single associated with lower education and younger age. Single marital status is positively correlated with ethnicity (r =.33, p < .001), such that being single is related to being African American. Income is positively correlated with mother years of education (r =.27, p < .001) and mother age (r =.25, p < .001), meaning lower income is associated with lower education levels and younger age. Income is negatively correlated with ethnicity (r =-.20, p < .001) and single marital status (r =-.38, p < .001), such that lower income is associated with being African American and single. Overall, the correlations of the variables included

in the study suggest that our regression models should show some significant predictions among our study variables.

Multivariate Analysis

Main Effects. The model fit statistics for the main effects model including controls, shown in Figure 1, indicate that the fit was good (χ^2/df =1.67, p =.12; *RMSEA* =.03, p =.74). Mother's health (MH) at child age 4 ($\beta_{MH->CH}$=.08, r=10, p <.05) and mother's depression (MD) at child age 4 ($\beta_{MD->CH}$=-.07, r= -.09, p <.05) predicted change in child health (CH) from age 4 to age 6. Significant change existed in child health from age 4 to 6 ($\beta_{CH4->6}$ =.29, r=.28 , p <.001). Mother's depression at child age 4 ($\beta_{MD->EXT}$=1.23, r= .13, p <.01) predicted change in child externalizing behavior (EXT) from age 4 to age 6 and significant change did exist in child externalizing across that time period ($\beta_{EXT4->6}$ =.60, r=.61, p <.001). Mother's depression at child age 4 ($\beta_{MD->INT}$=.97, r= .15, p <.001) predicted change in child internalizing behavior (INT) from age 4 to age 6 and significant change did exist in child internalizing across that time period ($\beta_{INT4->6}$ =.58, r=.52, p <.001). All autoregressive effects were significant (Table 3), and thus are not included in Figure 1. Controlling for all else in the model, 13% of the variance in child health at age 6 is predicted, 45.5% of child externalizing symptom variance is predicted, and 35.3% of child internalizing symptom variance is predicted.

Moderation Effects. The moderation model examined non-maltreated females (NMF), non-maltreated males (NMM), maltreated females (MF), and maltreated males (MM), with each group differing in significant findings. The model fit statistics for the multiple group model including controls indicate that the fit was good (χ^2/df=2.45, p = .00; *RMSEA* =.10, p = .00). For all of the groups, the effect of child health at age 4 was significant

in predicting child health at age 6 ($\beta_{CH4->6\_NMF}$=.38, *r*=.35, *p* <.001; $\beta_{CH4->6\_NMM}$=.34, *r*=.31, *p* <.001; $\beta_{CH4->6\_MF}$=.22, *r*=.25, *p* <.01; $\beta_{CH4->6\_MM}$=.27, *r*=.27, *p* <.01), the effect of child internalizing at age 4 was significant in predicting child internalizing at age 6 ($\beta_{INT4->6\_NMF}$=.45, *r*=.50, *p* <.001; $\beta_{INT4->6\_NMM}$=.48, *r*=.59, *p* <.001; $\beta_{INT4->6\_MF}$=.67, *r*=.60, *p* <.001; $\beta_{INT4->6\_MM}$=.63, *r*=.50, *p* <.001), and the effect of child externalizing at age 4 was significant in predicting child externalizing at age 6 ($\beta_{EXT4->6\_NMF}$=.44, *r*=.41, *p* <.001; $\beta_{EXT4->6\_NMM}$=.57, *r*=.47, *p* <.001; $\beta_{EXT4->6\_MF}$=.53, *r*=.56, *p* <.001; $\beta_{EXT4->6\_MM}$=.72, *r*=.73, *p* <.001). These autoregressive effects are found in Table 3, and thus not included in group figures.

Mother's physical health at child age 4 has an effect on child health at age 6 for maltreated females ($\beta_{MH->CH\_MF}$=.11, *r*=.15, *p* >.10), child externalizing for maltreated females ($\beta_{MH->EXT\_MF}$=1.32, *r*=.12, *p* <.05) and internalizing for maltreated males ($\beta_{MH->INT\_MM}$=-1.60, *r*=-.20, *p* <.05). Mother depression at child age 4 is predictive of child health for maltreated males ($\beta_{MD->CH\_MM}$=-.11, *r*=-.16, p <.10), externalizing for maltreated and non-maltreated females (β_{MD-EXT_MF}=1.74, *r*=.18, *p* <.05; $\beta_{MD->EXT\_NMF}$=1.32, *r*=.17, *p* <.05) and internalizing for non-maltreated females ($\beta_{MD->INT\_NMF}$=1.19, *r*=.19, *p* <.05) and males ($\beta_{MD->INT\_NMM}$=.92, *r*=.15, *p* <.05).

For the group of non-maltreated females shown in Figure 2, mother depression is related to change in child externalizing and internalizing, controlling for all else in the model. For NMF, 14.2% of the variance in child physical health, 38.1% of the variance in child externalizing symptoms, and 27.5% of the variance in child internalizing symptoms are predicted for this group. For the group of non-maltreated males shown in Figure 3, mother depression is related to change in child internalizing, controlling for all else. For NMM, 14.2% of the variance in child physical health, 38.1% of the variance in child

externalizing symptoms, and 27.5% of the variance in child internalizing symptoms are predicted for this group. For the group of maltreated females shown in Figure 4, mother health is related to child health and externalizing and mother depression is related to child externalizing, controlling for all other variables. For MF, 14.1% of the variance in child physical health, 48.2% of the variance in child externalizing symptoms, and 49.6% of the variance in child internalizing symptoms are predicted for this group. For the group of maltreated males shown in Figure 5, mother health is related to child internalizing and mother depression is related to child health, controlling for all else. For MM, 15.5% of the variance in child physical health, 64.8% of the variance in child externalizing symptoms, and 40.9% of the variance are predicted in child internalizing symptoms.

Discussion

Based on the literature, we hypothesized that maternal depression and physical health when children are 4 would predict change in child physical health, internalizing behavior, and externalizing behavior when children are 6. Some, but not all, of our findings supported this hypothesis. Overall, mother's physical health does predict child physical health, but not child externalizing or internalizing behaviors. This means that when mothers have poorer health, their children have poorer health over time from age 4 to age 6. This finding of the relationship between mother and child physical health is pertinent to this understudied area of physical health within parent-child dyads. Despite previous research on maternal health and child behaviors (Kahn et al., 2002; Mensah & Kiernan, 2011; Osborn, 2007), we found that mother's physical health does not predict internalizing or externalizing problems in children over time when simultaneously examining mother depression and earlier levels of health and behaviors. This means that in our high-risk sample, mother's physical health is not a significant factor in determining child behavioral functioning. As expected, maternal depression predicts all outcomes: child health, internalizing and externalizing. This fits with previous literature suggesting maternal depression is detrimental to the physical and emotional development of young children. When undifferentiated by maltreatment or gender, maternal depression is a more consistent predictor of child outcomes (except child externalizing) than mother physical health over time, suggesting depression interferes with parenting more than maternal physical health.

While the main effects were clear that maternal depression affects child behaviors and health and maternal physical health effects child physical health, the effects were varied when examining multiple groups. Again, based on previous research, we hypothesized that these effects from age 4 to age 6 would be different for boys and girls and for whether the child was maltreated or not. Our findings support our hypothesis, with mother's health and depression having unique effects on each group.

While maternal depression was related to all outcomes in the population, the effects differed by sex and maltreatment status. Mother depression is related to child health for maltreated males, externalizing for maltreated and non-maltreated females, and internalizing for non-maltreated females and males. Clearly, maltreatment and gender influence how maternal depression effects child internalizing and externalizing over time.

Maternal depression is linked to internalizing symptoms, but only for non-maltreated children. Non-maltreated children, both females and males, experienced more change in internalizing behaviors when mothers had high levels of depression. The more depressed the mother, the greater the increase in internalizing behaviors for the children. These effects for non-maltreated children are to be expected according to previous research, with depressed mothers being less responsive and less helpful to their children in regulating their emotions. In addition, perhaps children who have not been maltreated are more attentive to their mothers' cues and social learning situations, thus displaying more internalizing symptoms that they have learned from their mother. Maternal depression did not have an effect on internalizing symptoms over time in maltreated children, suggesting that they have adaptive processes screening them from internalizing effects of

maternal depression. However, these adaptive processes come at a cost—poorer health for maltreated males and more externalizing symptoms for maltreated females.

When maternal depression is high, maltreated males have more of a decline in physical health. Interestingly, maltreated males only experienced negative physical health consequences of having a depressed mother, suggesting something unique about being a maltreated male with a depressed mother. Perhaps maltreated males have more of physiological reactions to this stressor than females or non-maltreated males. Maternal depression was not related to behavioral problems for males who have been maltreated, however these boys are experiencing relatively more severe emotional and behavioral problems than their non-maltreated male counterparts based on the mean scores for this group on internalizing and externalizing, suggesting that factors other than their mothers' depression levels attribute to these problems. Mother health is one of these factors, and we can assume that being maltreated can also explain some of these problems, as well as factors we did not focus on in this study.

Both maltreated and non-maltreated females experienced more change in externalizing behavior when mother depression was high. When mothers had greater depression, females had more externalizing symptoms over time. This finding is surprising given that Goodman et al. (2011) found in their meta-analysis that females were more likely to display internalizing symptoms than males, and no differences existed for externalizing symptoms between males and females. Other researchers have found that males are more likely than females to experiences externalizing symptoms when mothers are depressed (Grace, Evindar, & Stewart, 2003; Turney, 2011). More evidence is needed

to explain why this increase in externalizing is present for females with depressed mothers, but not for males in our study.

Mother's health is related to child health and externalizing behaviors for maltreated females, and internalizing behaviors for maltreated males. Notably, mother health is important for the maltreated children of both sexes, but had no effect on children who were not maltreated. Perhaps for this maltreated group, having poor health as a mother involves having fewer resources to protect and care for your children, putting them at risk for being abused and receiving less preventative health care. These maltreated children may also be more sensitive than non-maltreated children to the subtle effects of maternal health .

Maltreated females appear to be the most vulnerable to the effects of mother's health, experiencing decreases in physical health and decreases in externalizing behaviors when mothers' have poorer health at child age 4. This decrease in externalizing behaviors for maltreated females is not what we would have expected. Perhaps these females are taking on a gender-related care-taking role, and as a part of their role in compensating for their disabled mother, they show less behavioral acting out. While externalizing behaviors can be a call for responsiveness from a parent, in children who have been abused and neglected in the past, externalizing may be unproductive in getting needs met or maladaptive in receiving abuse as a response. These effects may be highlighted when children face more vulnerabilities, such as having a mother in poor health and experiencing abuse.

Another important finding is that poor mother health predicted a higher change in internalizing symptoms for maltreated males. Being maltreated may already increase internalizing, which is then heightened by child anxiety and depression over maternal

illness. Another explanation could be that mothers protect their children from abuse and provide comfort for emotional distress, and when mothers have poor health they are less able to protect and comfort their children, therefore the child is vigilant for threats.

Maltreated females are particularly vulnerable to increases in externalizing behaviors related to mother characteristics of health and depression. Perhaps these females are resorting to behavioral outbursts as a means of receiving desired attentiveness from a mother distanced by depression and health problems.

Little to no research has focused on the differences between these four groups over time. Given that maltreated females, maltreated males, non-maltreated females, and non-maltreated males were all affected by maternal health and depression differently, these findings add valuable information to the literature.

Our results are important to consider in the care for children. Mothers are obviously very important in influencing the development of child health and behavior, therefore mothers physical and mental health concerns should not be ignored by professionals treating the health problems of children. For mental health professionals, mothers need to be involved and made aware of the need to take care of their own health as part of treating their children. Professionals and insurance companies should support treatment of the family as a whole and in family modalities, monitoring not only the health of children but also their mothers. Physicians should consider the health of mothers as well as the children they treat, advocating for treatment to promote overall well being for the caregiver. Pediatricians should continue looking for maternal depression throughout childhood, with all healthcare providers educating parents on the importance of self-care.

On a societal level, support for the health of women is very valuable based on these findings. Both public and private agencies should work to make health care more easily accessible for these vulnerable populations. With the high cost of medical and behavioral treatment, specialized focus on mother health could help ameliorate future costs for their growing children. Maltreated children seem to be at the highest risk of negative effects, with more effort towards identifying risk of maltreatment and providing opportunities for these families to gain resources needed in this population. These effects could be part of a globally harmful environment for child development, suggesting intervention in these environments through preventative medicine, mental health treatment, and socioeconomic growth could be helpful.

The limitations of this study include that it is a high-risk population with low socioeconomic status, and thus findings cannot be applied to the general population. We also selected only those children who had their mother as primary caregiver, thus excluding generalization to the many children living with grandparents, single fathers, and foster parents. In addition, the physical health measures could be more in-depth and include different reporters. Our measures are either self-report or mother report, which could be biased. Particularly, mothers who are depressed may have skewed perceptions, seeing their children are having more problems (Goodman et al, 2010; Turney, 2011). Another limitation is that we use reports of abuse, but we were not able to separate this by type of abuse (sexual, physical, neglect, etc) due to small group sizes. We also did not include information on perpetrators of the abuse. These limitations are understandable for such a study, but if possible, should be addressed in the future.

This study is unique in its incorporation of both mental and physical health of mothers and children with maltreatment status. We also examined both main effects and effects by maltreatment status and sex, a 4-group analysis which not been conducted in this population to our knowledge. The strengths of this study also include large sample size and longitudinal design spanning 2 years.

More research is needed to examine the influence of maternal health on children's physical health. While our study examined global physical health, future studies could include more detailed health information. This could include different types of health problems as well as health care professional reports on participant physical health. Future studies should continue to explore the differing effects on sub-groups of children. Future studies could benefit from having more than one report on child behaviors, as well as having observational and secondary reports for mothers' depression and health. The field could benefit from further understanding of the effects of caregivers by broadening the scope from the health of mothers to the health fathers and additional other caregivers, as well. In addition, researchers could study different races, with correlations suggesting that effects may differ according to race. Examining effects over longer time periods would also be beneficial to see how stable the influences of mothers health and maltreatment are as children age. Mechanisms of transmission, such as attachment quality, should also be studied to improve our understanding of how mother health is related to child health.

This study informs the literature on the relationship between mother and child health in light of child maltreatment and sex. In general, we found that maternal physical health predicts child physical health, and maternal depression predicts child physical health, externalizing behaviors, and internalizing behaviors. By maltreatment and sex,

maltreated females were the most effected, with mother health predicting child physical health and externalizing and mother depression predicting externalizing. Maltreated males were affected by mother health on internalizing behaviors and mother depression on health. For non-maltreated children, mothers health did not matter, but mother depression is related to child externalizing and internalizing for females and child internalizing for males. In conclusion, we found that mothers' health and depression are related to child health and behavior problems, and maltreatment and sex do matter.

References

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4-18 & 1991 Profile*. Burlington: University of Vermont Department of Psychiatry.

Achenbach, T. M. (1993). *Empirically based taxonomy: How to use syndromes and pro- file types derived from the CBCL/4-18, TRF, and YSR.* Burlington: University of Vermont Department of Psychiatry.

Acock, A. C. (2005). Working with missing values. *Journal Of Marriage & Family*, 67(4), 1012-1028. doi:10.1111/j.1741-3737.2005.00191.x

Alink, L. A., Cicchetti, D., Kim, J., & Rogosch, F. A. (2012). Longitudinal associations among child maltreatment, social functioning, and cortisol regulation. *Developmental Psychology*, 48, 224-236. doi:10.1037/a0024892

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.

Berg-Nielsen, T., Vikan, A., & Dahl, A. A. (2002). Parenting related to child and parental psychopathology: A descriptive review of the literature. *Clinical Child Psychology And Psychiatry*, 7, 529-552. doi:10.1177/1359104502007004006

Blegen, N. E., Hummelvoll, J. K., & Severinsson, E. (2010). Mothers with mental health problems: A systematic review. *Nursing & Health Sciences*, 12, 519-528. doi:10.1111/j.1442-2018.2010.00550.x

Bolger, K., Thomas, M., & Eckenrode, J. (1997) Disturbances in relationships: Parenting, family development, and child maltreatment. In J. Gardarino & J. Eckenrode (Eds.), *Understanding Abusive Families* (pp. 86-98). San Francisco, CA: Jossey-Bass Publishers.

Bowlby, J. (1988). *A secure base: Parent-child attachment and health human development.* New York, NY: Basic Books, Inc., Publishers.

Bowlby, J. (1989). The role of attachment in personality development and psychopathology. In S.I. Greenspan, & G.H. Pollock (Eds.), *The course of life: Volume 1: Infancy* (pp. 229-270). Madison, CT: International Universities Press, Inc.

Bretherton, I. (1995). The origins of attachment theory: John Bowlby and Mary Ainsworth. In S. Goldberg, R. Muir, & J. Kerr (Eds.), *Attachment theory: Social, developmental, and clinical perspectives* (pp. 45-84). Hillsdale, NJ: The Analytic Press.

Bretherton, I., & Munholland, K.A. (1999). Internal working models in attachment relationships: A construct revisited. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (pp. 89-111). New York: Guilford Press.

Casey, P., Goolsby, S., Berkowitz, C., Frank, D., Cook, J., Cutts, D., Black, M. M., Zaldivar, N., Levenson, Z., Heeren, T., & Meyers, A. (2004). Maternal depression, changing public assistance, food security, and child health status. *Pediatrics*, 113, 298-304. Retrieved from http://go.galegroup.com/ps/i.do?&id=GALE%7CA113646330&v=2.1&u=avl_gscholar&it=r&p=AONE&sw=w

Cicchetti, D., Toth, S.L., & Lynch, M. (1995). Bowlby's dream comes full circle: The application of attachment theory to risk and psychopathology. In T.H. Ollendick & R.J. Prinz (Eds.), *Advances in clinical child psychology* (pp. 1-75). New York: Plenum Press.

Cohen, J. A., Mannarino, A. P., & Deblinger, E. (2006). *Treating Trauma and Traumatic Grief in Children and Adolescents*. New York, NY: Guilford Publications.

Colman, R. A., & Widom, C. (2004). Childhood abuse and neglect and adult intimate relationships: a prospective study. *Child Abuse & Neglect*, 28, 1133-1151. doi:10.1016/j.chiabu.2004.02.005

Combs-Orme, T., Heflinger, C., & Simpkins, C. G. (2002). Comorbidity of mental health problems and chronic health conditions in children. *Journal Of Emotional And Behavioral Disorders*, 10(2), 116-125. doi:10.1177/10634266020100020601

Cooper. C., Bebbington, P. E., Meltzer, H., Bhurgra, D., Brugha, T., Jenkins, R., Farrell, M, and King, M. (2008). Depression and common mental disorders in lone parents: results of the 2000 National Psychiatric Morbidity Survey. *Psychological Medicine*. 38, 335–342.

Crittenden, P. M. (1988). Relationships at risk. In Belsky & Nezworski (Eds.), *Clinical implications of attachment theory* (pp. 136-174). Hillsdale, JNJ: Erlbaum.

D'Andrea, W., Sharma, R., Zelechoski, A. D., & Spinazzola, J. (2011). Physical health problems after single trauma exposure: When stress takes root in the body. *Journal Of The American Psychiatric Nurses Association*, 17, 378-392. doi:10.1177/1078390311425187

Earls, F., & Carlson, M. (2001). The social ecology of child health and well-being. *Annual Review of Public Health*, 22, 143.

Edelbrock, C., & Costello, A. J. (1988). Convergence between statistically derived behavior problem syndromes and child psychiatric diagnoses. *Journal of Abnormal Child Psychology*, 16, 219–231.

Evans, S., Keenan, T. R., & Shipton, E. A. (2007). Psychosocial adjustment and physical health of children living with maternal chronic pain. *Journal Of Paediatrics & Child Health*, 43, 262-270. doi:10.1111/j.1440-1754.2007.01057.x

Flaherty, E.G., Thompson, R., Litrownik, A.J., Theodore, A., English, D.J., Black, M.M., Wike, T., Whimper, L. Runyan, D.K., & Dubowitz, H. (2006). Effect of early childhood adversity on child health. *Archives of Pediatric and Adolescent Medicine*. 160, 1232-1238. Retrieved from http://archpedi.ama-assn.org/cgi/reprint/160/12/1232.

Flinn, M.V. (1999). Family environment, stress, and health during childhood. In C. Panter-Brick & C.M. Worthman (Eds.) *Hormones, health, and behavior* (pp. 105 -138). New York: Cambridge University Press.

Garbarino, J., & Eckenrode, J. (1997) The Meaning of Maltreatment. In J. Gardarino & J. Eckenrode (Eds.), *Understanding Abusive Families* (pp. 3-25). San Francisco, CA: Jossey-Bass Publishers.

Grace, S. L., Evindar, A. A., & Stewart, D. E. (2003). The effect of postpartum depression on child cognitive development and behavior: A review and critical analysis of the literature. *Archives Of Women's Mental Health*, 6, 263-274. doi:10.1007/s00737-003-0024-6

Goodman, S. H., Rouse, M. H., Connell, A. M., Broth, M., Hall, C. M., & Heyward, D. (2011). Maternal depression and child psychopathology: A meta-analytic review. *Clinical Child & Family Psychology Review*, 14, 1-27. doi:10.1007/s10567-010-0080-1

Hillberg, T., Hamilton-Giachritsis, C., & Dixon, L. (2011). Review of meta-analyses on the association between child sexual abuse and adult mental health difficulties: A systematic approach. *Trauma, Violence & Abuse*, 12(1), 38-49. doi:10.1177/1524838010386812

Hussey, J. M., Marshall, J., English, D. J., Knight, E., Lau, A. S., Dubowitz, H., & Kotch, J. B. (2005). Defining maltreatment according to substantiation: Distinction without a difference?. *Child Abuse & Neglect*, 29, 479-492. doi:10.1016/j.chiabu.2003.12.005.

Kahn, R.S., Zuckerman, B., Bauchner, H., Homer, C.J., & Wise, P.H. (2002). Women's health after pregnancy and child outcomes at age 3 years: a prospective cohort study. *American Journal of Public Health*, 92, 1312-1318.

Kahng, S. K., Oyserman, D., Bybee, D., & Mowbray, C. (2008). Mothers with serious mental illness: When symptoms decline does parenting improve?. *Journal Of Family Psychology*, 22, 162-166.

Keiley, M., Howe, T. R., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2001). The timing of child physical maltreatment: A cross-domain growth analysis of impact on adolescent externalizing and internalizing problems. *Development And Psychopathology*, 13, 891-912.

Kelly, D., Faust, J., Runyon, M. K., & Kenny, M. C. (2002). Behavior problems in sexually abused children of depressed versus nondepressed mothers. *Journal of Family Violence*, 17, 107-116. doi:10.1023/A:1015010616071

Kim, J., & Cicchetti, D. (2010). Longitudinal pathways linking child maltreatment, emotion regulation, peer relations, and psychopathology. *Journal Of Child Psychology And Psychiatry*, 51, 706-716. doi:10.1111/j.1469-7610.2009.02202.x

Kohl, P. L., Jonson-Reid, M., & Drake, B. (2011). Maternal mental illness and the safety and stability of maltreated children. *Child Abuse & Neglect*, 35, 309-318. doi:10.1016/j.chiabu.2011.01.006

Kotch, J. B., Lewis, T., Hussey, J. M., English, D., Thompson, R., Litrownik, A. J., Runyan, D. K., Bangdiwala, S.I., Margolis, B., & Dubowitz, H. (2008). Importance of early neglect for childhood aggression. *Pediatrics*, 121, 725-731. doi:10.1542/peds.2006-3622.

Krause, N., & Jay, G. (1994). What do global health items measure? *Medical Care*, 9, 930-942.

Lanier, P., Jonson-Reid, M., Stahlschmidt, M., Drake, B., & Constantino, J. (2010). Child maltreatment and pediatric health outcomes: A longitudinal study of low-income children. *Journal Of Pediatric Psychology*, 35, 511-522. doi:10.1093/jpepsy/jsp086

Lesesne, C. A., & Kennedy, C. (2005). Starting early: Promoting the mental health of women and girls throughout the life span. *Journal Of Women's Health*, 14, 754-763. doi:10.1089/jwh.2005.14.754

Li, F., Godinet, M. T., & Arnsberger, P. (2011). Protective factors among families with children at risk of maltreatment: Follow up to early school years. *Children and Youth Services Review*, 33, 139-148.

Litrownik, A., (2009). *LONGSCAN measures selection, construction, and use presentation* [PowerPoint Slides]. Retrieved from National Data Archive on Child Abuse and Neglect: http://www.ndacan.cornell.edu/ndacan/User_Support/LONGSCAN_Support.html

Loeber, R., Hipwell, A., Battista, D., Sembower, M., & Stouthamer-Loeber, M. (2009). Intergenerational transmission of multiple problem behaviors: Prospective relationships between mothers and daughters. *Journal Of Abnormal Child Psychology: An Official Publication Of The International Society For Research In Child And Adolescent Psychopathology,* 37, 1035-1048. doi:10.1007/s10802-009-9337-x

MacKenzie, M. J., Kotch, J. B., Lee, L., Augsberger, A., & Hutto, N. (2011). A cumulative ecological–transactional risk model of child maltreatment and behavioral outcomes: Reconceptualizing early maltreatment report as risk factor. *Children And Youth Services Review*, 33, 2392-2398. doi:10.1016/j.childyouth.2011.08.030

Maruish, M. E. (1999). *Use of psychological testing for treatment planning and outcome assessment.* Lawrence Erlbaum Associates.

McEwen, B. S., & Stellar, E. (1993). Stress and the individual: Mechanisms leading to disease. *Archives of Internal Medicine, 153,* 2093– 2101.

Mensah, F. K. and Kiernan, K. E. (2011), Maternal general health and children's cognitive development and behaviour in the early years: findings from the Millennium Cohort Study. *Child: Care, Health and Development*, 37: 44–54. doi: 10.1111/j.1365-2214.2010.01150.x

Meuret, A. E., Ehrenreich, J. T., Pincus, D. B., & Ritz, T. (2006). Prevalence and correlates of asthma in children with internalizing psychopathology. *Depression & Anxiety* (1091-4269), 23, 502-508. doi:10.1002/da.20205

Middleton, M., Scott, S. L. and Renk, K. (2009), Parental depression, parenting behaviours, and behaviour problems in young children. *Infant and Child Development*, 18: 323–336. doi: 10.1002/icd.598

Minkovitz, C. S., Strobino, D., Scharfstein, D., Hou, W., Miller, T., Mistry, K. B., & Swartz, K. (2005). Maternal depressive symptoms and children's receipt of health care in the first 3 years of life. *Pediatrics*, 115, 306-314. doi:10.1542/peds.2004-0341

Mordoch, E., & Hall, W. A. (2002). Children living with a parent who has a mental illness: A critical analysis of the literature and research implications. *Archives Of Psychiatric Nursing*, 16, 208-216. doi:10.1053/apnu.2002.36231

Muller, R. T., Lemieux, K. E., & Sicoli, L. A. (2001). Attachment and psychopathology among formerly maltreated adults. *Journal Of Family Violence*, 16, 151-169.

Mullick, M., Miller, L.J., and Jacobsen, T (2001). Insight into mental illness and child maltreatment risk among mothers with major psychiatric disorders. *Psychiatric Services*, 52, 488–492.

Muthén, L.K. & Muthén, B.O. (1998-2007). *Mplus user's guide. Fifth Edition*. Los Angeles, CA: Muthén & Muthén (Chapter 2, pp. 11-16; Chapter 3, pp. 17-21; Chapter 12, pp. 359-363).

Nicholson, J., Biebel, K., Kinden, B., Henry, A., & Stier, L. (2001). *Critical issues for parents with mental illness and their families.* Retrieved from http://escholarship.umassmed.edu/cgi/viewcontent.cgi?article=1142&context=psyps_pp&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar%3Fhl%3Den%22q%3DCritical%2Bissues%2Bw

Nicholson, J. S., Deboeck, P. R., Farris, J. R., Boker, S. M., & Borkowski, J. G. (2011). Maternal depressive symptomatology and child behavior: Transactional relationship with

simultaneous bidirectional coupling. *Developmental Psychology*, 47, 1312-1323. doi:10.1037/a0023912

O'Connell, K. (2008). What Can We Learn? Adult outcomes in children of seriously mentally ill mothers. *Journal Of Child & Adolescent Psychiatric Nursing*, 21, 89-104. doi:10.1111/j.1744-6171.2008.00136.x

Osborn, T. (2007). The psychosocial impact of parental cancer on children and adolescents: A systematic review. *Psycho-Oncology,* 16, 101-126. doi:10.1002/pon.1113

Panter-Brick, C., & Brooks-Gunn, J. (Eds.). (1997). *Hormones, health, and behavior: A socio-ecological and lifespan perspective*. Cambridge, UK: Cambridge University Press.

Pastor, P.N., & Reuben, C.A. (2011). Maternal Reports of Child Health Status and Health Conditions: The Influence of Self-Reported Maternal Health Status. *Academic Pediatrics*, 11, 311-317. doi:10.1016/j.acap.2011.05.003

Pfefferle, S. G., & Spitznagel, E. L. (2009). Children's mental health service use and maternal mental health: A path analytic model. *Children and Youth Services Review*, 31, 378-382. doi:10.1016/j.childyouth.2008.09.003

Pinquart, M., & Shen, Y. (2011). Depressive symptoms in children and adolescents with chronic physical illness: An updated meta-analysis. *Journal Of Pediatric Psychology*, 36, 375-384. doi:10.1093/jpepsy/jsq104

Propper, C., Rigg, J., & Burgess, S. (2007). Child health: Evidence on the roles of family income and maternal mental health from a UK birth cohort. *Health Economics*, 16, 1245-1269. doi:10.1002/hec.1221

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385–401.

Rakow, A., Smith, D., Begle, A. M., & Ayer, L. (2011). The association of maternal depressive symptoms with child externalizing problems: The role of maternal support following child sexual abuse. *Journal Of Child Sexual Abuse: Research, Treatment, & Program Innovations For Victims, Survivors, & Offenders,* 20, 467-480.

Ranson, K. E., & Urichuk, L. J. (2008). The effect of parent-child attachment relationships on child biopsychosocial outcomes: A review. *Early Child Development And Care*, 178, 129-152. doi:10.1080/03004430600685282.

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin*, 128, 330-366. doi:10.1037/0033-2909.128.2.330

Rey, J. M., & Morris-Yates, A. (1992). Diagnostic accuracy in adolescents of several depression rating scales extracted from a general purpose behavior checklist. *Journal of Affective Disorders*, 26, 7–16.

Riley, A. W., Coiro, M., Broitman, M., Colantuoni, E., Hurley, K. M., Bandeen-Roche, K., & Miranda, J. (2009). Mental health of children of low-income depressed mothers: Influences of parenting, family environment, and raters. *Psychiatric Services*, 60, 329-336. doi:10.1176/appi.ps.60.3.329

Rogosch, F. A., Dackis, M. N., & Cicchetti, D. (2011). Child maltreatment and allostatic load: Consequences for physical and mental health in children from low-income families. *Development And Psychopathology,* 23, 1107-1124. doi:10.1017/S0954579411000587

Runyan, D. K., Curtis, P., Hunter, W. M., Black, M. M., Kotch, J. B., Bangdiwala, S., Dubowitz, H., English, D., Everson, M., & Landsverk, J. (1998). LONGSCAN: A consortium for

longitudinal studies of maltreatment and the life course of children. *Aggression and Violent Behavior: A Review Journal, 3,* 275-85.

Stronach, E., Toth, S. L., Rogosch, F., Oshri, A., Manly, J., & Cicchetti, D. (2011). Child maltreatment, attachment security, and internal representations of mother and mother-child relationships. *Child Maltreatment,* 16, 137-145. doi:10.1177/1077559511398294

Takei, T., Yamashita, H., & Yoshida, Keiko. (2006) The mental health of mothers of physically abused children: The relationship with children's behavioural problems—reports from Japan. *Child Abuse Review.* 15, 204-218. DOI: 10.1002/car.936.

Timko, C. C., Cronkite, R. C., Swindle, R. R., Robinson, R. L., Turrubiartes, P. P., & Moos, R. H. (2008). Functioning status of adult children of depressed parents: a 23-year follow-up. *Psychological Medicine*, 38, 343-353.

Tompson, M. C., Pierre, C. B., Boger, K., McKowen, J. W., Chan, P. T., & Freed, R. D. (2010). Maternal depression, maternal expressed emotion, and youth psychopathology. *Journal of Abnormal Child Psychology: An official publication of the International Society for Research in Child and Adolescent Psychopathology*, 38, 105-117. doi:10.1007/s10802-009-9349-6

Thompson, R., & Tabone, J. K. (2010). The impact of early alleged maltreatment on behavioral trajectories. *Child Abuse & Neglect*, 34, 907-916. doi:10.1016/j.chiabu.2010.06.006

Turney, K. (2011). Chronic and proximate depression among mothers: Implications for child well-being. *Journal Of Marriage And Family*, 73, 149-163. doi:10.1111/j.1741-3737.2010.00795.x

U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2011). *Child maltreatment 2010*. Available from http://www.acf.hhs.gov/programs/cb/stats_research/index.htm#can.

Weissman, M.M., Wickramaratne, P., Nomura,Y.,Warner, V., Verdeli, H., Pilowsky, D. J., Grillon, C., & Bruder, G., (2005). Families at high and low risk for depression: A 3-generation study. *Archives of General Psychiatry*, 62, 29–36.

Weissman, ,. M., Wickramaratne, ,., Nomura, Y., Warner, V., Pilowsky, D., & Verdeli, H. (2006). Offspring of depressed parents: 20 years later. *American Journal Of Psychiatry*, 163, 1001-1008.

Wheaton, B., Muthen, B., Alwin, D., Summers, G. (1977). Assessing reliability and stability in panel models. In D.Heise (Ed.). *Sociological methodology*. San Francisco, CA: Jossey-Bass. Pp. 84-136.

Appendix

Table 1a

Descriptive statistics for main predictor and outcome variables

	Overall Sample (*n* = 598)		Non-Maltreated Females (*n* = 173)		Non-Maltreated Males (*n* = 157)		Maltreated Females (*n* = 145)		Maltreated Males (*n* = 123)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Main Predictors (Age 4)										
Maternal Physical Health	2.97	0.77	3.06	0.76	2.96	0.77	2.97	0.78	2.87	0.75
Maternal Depression	13.66	10.61	12.79	9.14	13.05	10.56	14.03	11.88	15.23	10.96
Child Physical Health	3.49	0.64	3.53	0.65	3.49	0.62	3.48	0.66	3.46	0.61
Child Internalizing Symptoms	5.43	5.06	5.27	4.51	5.17	4.95	5.49	5.97	5.40	4.83
Child Externalizing Symptoms	12.93	8.52	11.63	7.24	12.56	8.44	13.92	8.88	14.27	9.67
Outcomes (Age 6)										
Child Physical Health	3.43	0.66	3.37	0.73	3.40	0.68	3.50	0.58	3.45	0.62
Child Internalizing Symptoms	6.49	5.70	6.08	5.04	5.78	5.00	7.23	6.68	7.08	6.04
Child Externalizing Symptoms	12.81	8.42	10.06	6.46	12.50	8.25	13.62	8.62	15.89	9.62

Table 1b

Descriptive statistics for control variables

	Overall Sample (*n* = 598)		Non-Maltreated Females (*n* = 173)		Non-Maltreated Males (*n* = 157)		Maltreated Females (*n* = 145)		Maltreated Males (*n* = 123)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Controls										
Mother Education	11.50	1.92	11.60	1.56	11.29	1.89	11.61	2.27	11.46	2.00
Mother Age	29.64	7.04	27.61	5.45	28.45	6.59	32.45	8.29	31.15	6.94
Ethnicity (black=1)	.57	.50	.73	.44	.61	.49	.52	.50	.33	.47
Single	.78	.42	.78	.42	.78	.41	.78	.42	.77	.42
Income	2.97	2.01	2.85	1.83	2.91	2.08	2.92	1.87	3.27	2.30
Child Gender (female=1)	.53	.50								
Maltreatment (maltreated=1)	.45	.50								

Table 2

Correlations between variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. CH Age 4	--														
2. CH Age 6	.32***	--													
3. Ext Age 4	-.09~	-.13*	--												
4. Ext Age 6	-.10~	-.09~	.65***	--											
5. Int Age 4	-.09~	-.17**	.66***	.41***	--										
6. Int Age 6	-.10~	-.19***	.45***	.63***	.60***	--									
7. MD	-.16**	-.23***	.30***	.33***	.34***	.37***	--								
8. MH	.14**	.15**	-.12*	-.12*	-.11*	-.13*	-.33***	--							
9. Mom Ed.	-.02	.02	.00	.03	-.06	-.02	-.18***	.03	--						
10. Mom Age	-.06	.05	.00	-.04	-.01	.03	-.02	.09	.21***	--					
11. Sex	.07	-.01	-.02	-.16**	.03	-.01	-.02	.07	.04	.05	--				
12. Malt.	-.04	.09~	.10~	-.17**	.06	.13*	.09	-.07	.01	.32***	.00	--			
13. Black	-.05	-.08	-.06	-.13*	-.09~	-.14**	.01	.16**	.02	-.03	.15**	-.26***	--		
14. Single	.02	-.07	.08	.03	.04	-.03	.09~	-.12	-.16**	-.14**	.02	-.02	.33***	--	
15. Income	-.00	.10~	.03	.05	.06	.07	-.18***	.10~	.27***	.25***	-.02	.08	-.20***	-.38***	--

Note. *** p<.001; **p<.01; *p<.05; ~p<.10

Table 3

Autoregressive Effects of Child Health, Externalizing and Internalizing by Main Effects, Non-Maltreated Females (NMF), Non-Maltreated Males (NMM), Maltreated Females (MF), and Maltreated Males (MM).

	Main Effect (B, Sig., Cor.)	NMF	NMM	MF	MM
Child Health	0.29*** (0.28)	0.38*** (0.35)	0.34*** (0.31)	0.22** (0.25)	0.27** (0.27)
Externalizing	0.60*** (0.61)	0.44*** (0.50)	0.57*** (0.59)	0.53*** (0.56)	0.72** (0.76)
Internalizing	0.58*** (0.52)	0.45*** (0.41)	0.48*** (0.47)	0.67*** (0.60)	0.63*** (0.50)

Note. *** $p<.001$; **$p<.01$

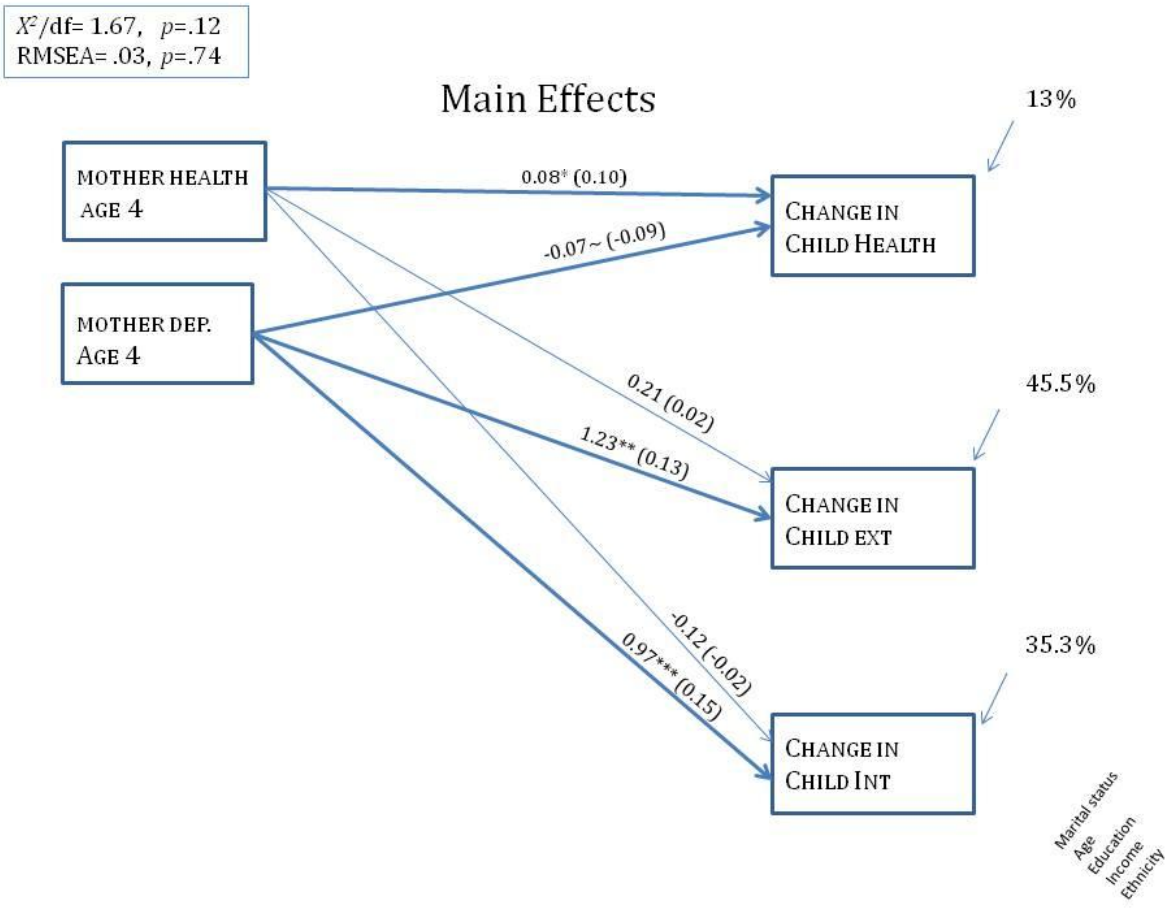

Figure 1. *Path analysis for mother physical health, mother depression, child physical health, child externalizing, and child internalizing across time from age 4 to age 6* (*N*= 598).

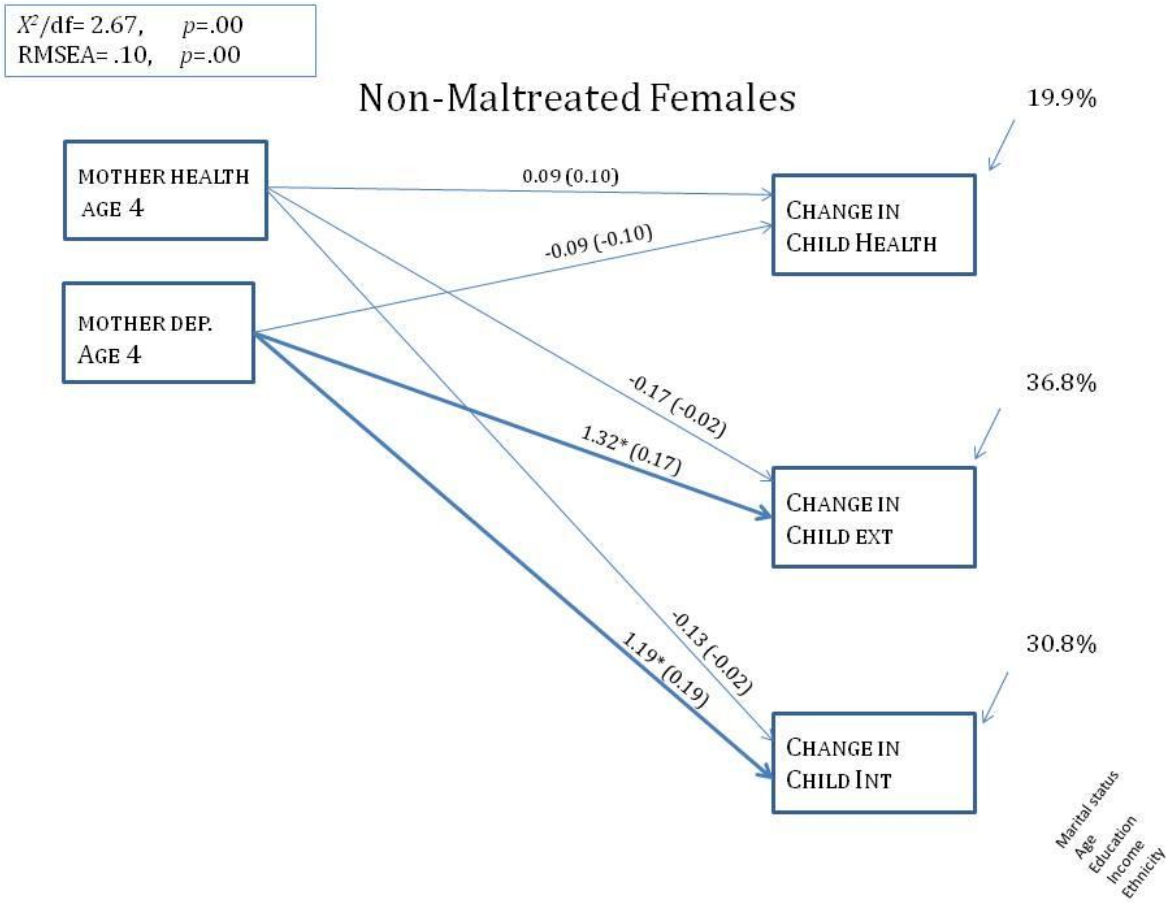

Figure 2. *Path analysis for mother physical health, mother depression, child physical health, child externalizing, and child internalizing across time from age 4 to age 6 for non-maltreated females* (*N*= 173).

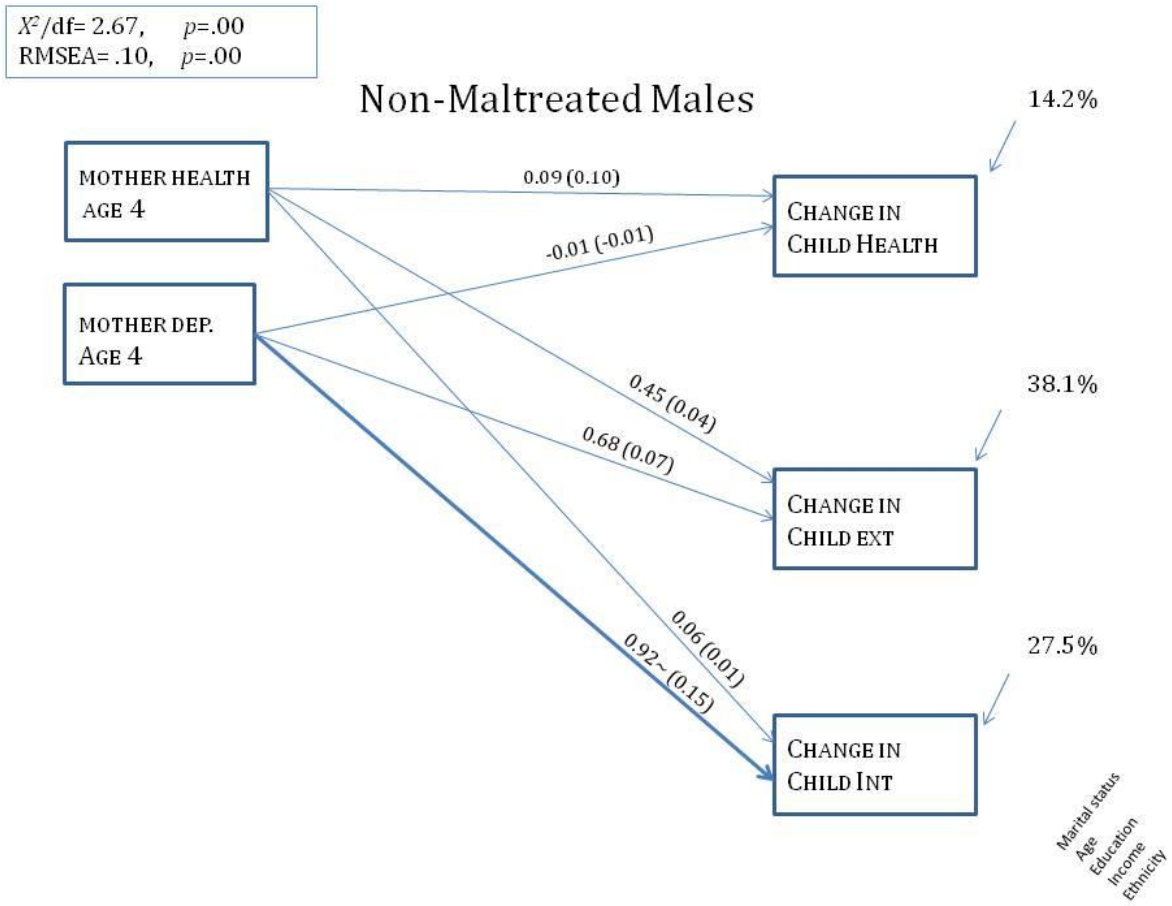

Figure 3. *Path analysis for mother physical health, mother depression, child physical health, child externalizing, and child internalizing across time from age 4 to age 6 for non-maltreated males* (*N*= 157).

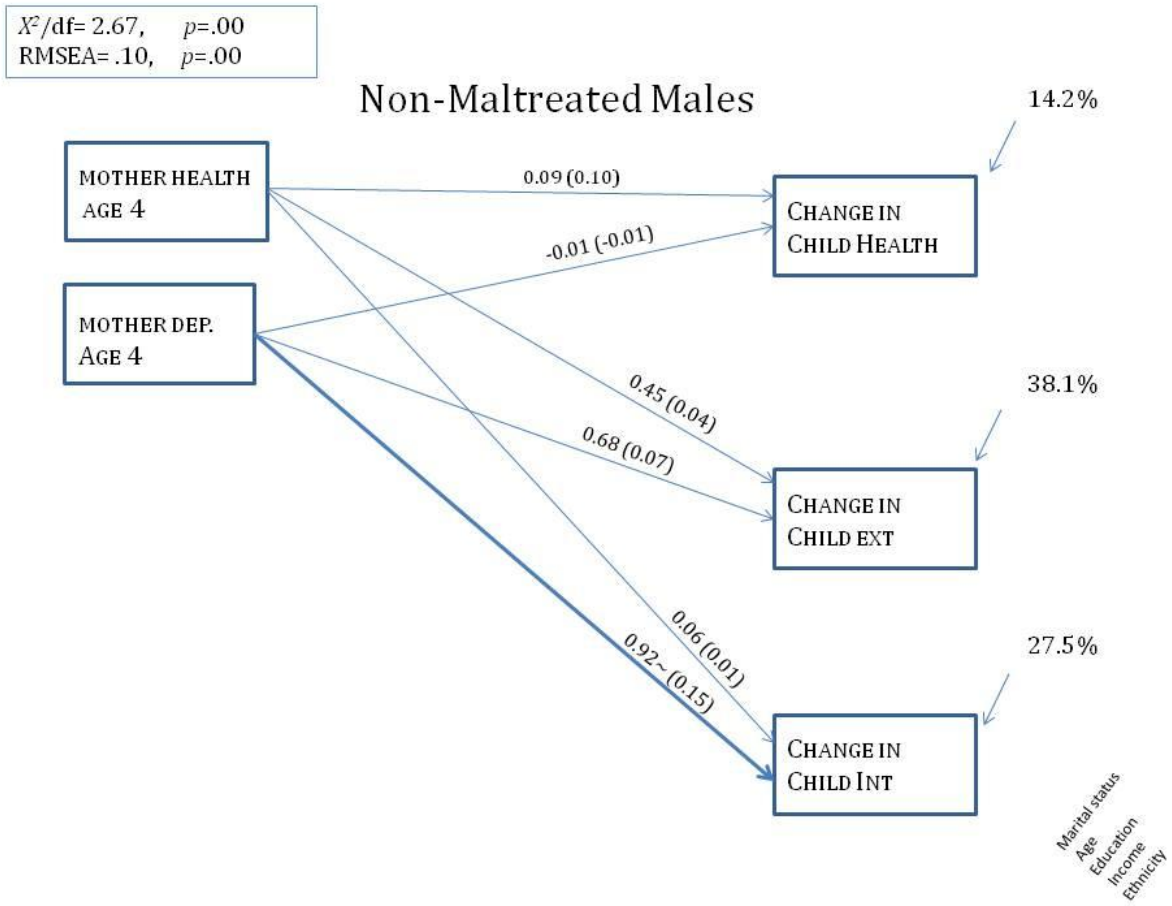

Figure 4. *Path analysis for mother physical health, mother depression, child physical health, child externalizing, and child internalizing across time from age 4 to age 6 for maltreated females* (*N*= 145).

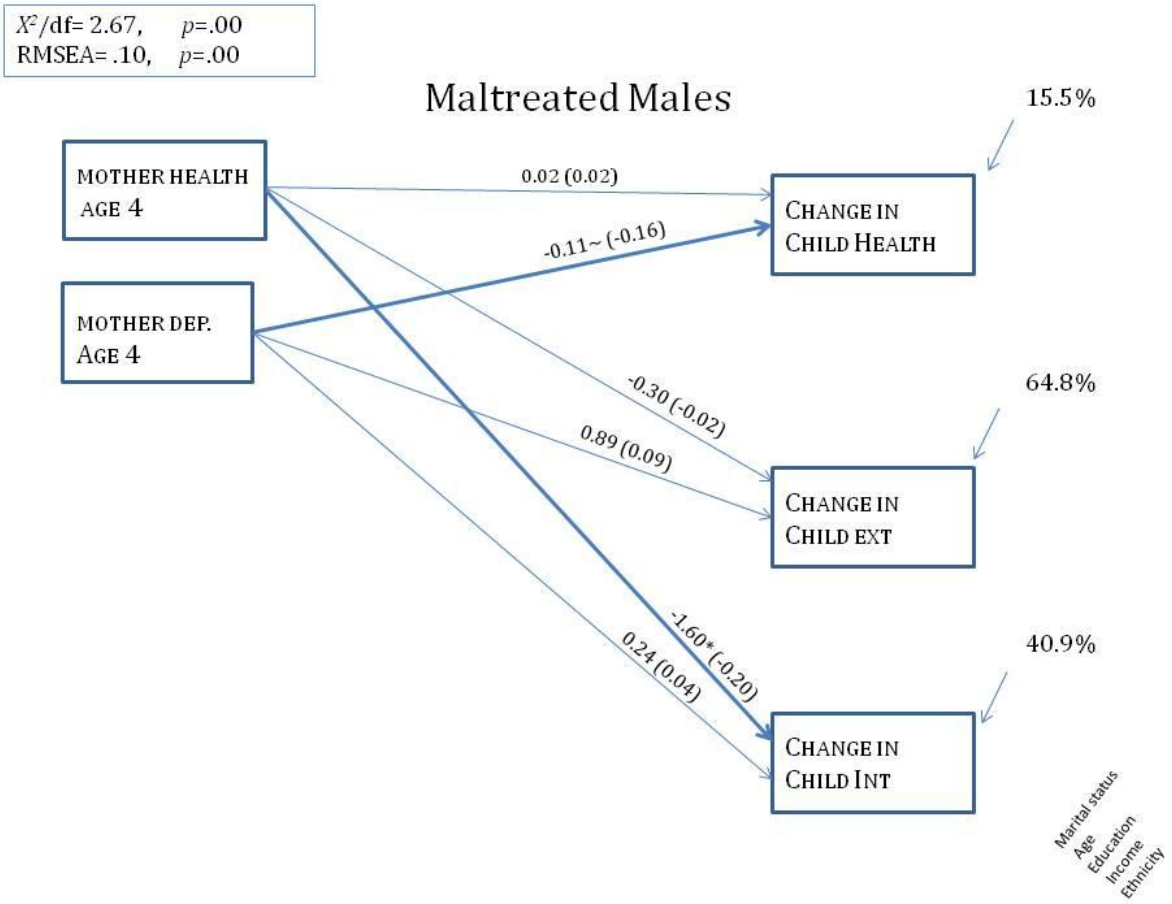

Figure 5. *Path analysis for mother physical health, mother depression, child physical health, child externalizing, and child internalizing across time from age 4 to age 6 for maltreated males* (*N*= 123).