Maternal psychological distress and early-childhood externalising behaviour: a longitudinal analysis of the UK Millennium Cohort Study

Caroline Michaela Coope

Thesis submitted for the degree of Doctor of Philosophy

University College London

2012

I, Caroline Michaela Coope, confirm that the work presented in this thesis is my own work. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

Evidence of a relationship between maternal psychological distress and child externalising behaviour is strong. However, less is known about the pathways and contexts involved, or how these may differ by gender or family structure. This thesis aims to contribute to the understanding of this relationship by investigating potential lifecourse hypotheses, moderators and mediators.

Methods: This thesis consists of a longitudinal analysis of the UK Millennium Cohort Study. Linear regression analyses are used to examine potential lifecourse effects in the relationship between maternal psychological distress at nine months and three years and externalising behaviour at five years. The pathways from socio-economic position via maternal psychological distress to child externalising behaviour, and from maternal psychological distress via parenting to child externalising behaviour, are examined using mediation analyses. The potential moderating role of gender, family structure, socio-economic position, emotional support, father-child relationship quality and mother-father relationship quality are investigated.

Results: Gender differences in the association between maternal psychological distress at nine months and three years and child externalising behaviour at age five were found, with a stronger association in boys. Lifecourse effects of a sensitive period at three years in girls and a cumulative effect of maternal psychological distress on externalising behaviour at five years in boys and girls were found. Self-rated financial status operated through maternal psychological distress to influence child externalising behaviour, whereas maternal education and housing tenure were independently associated with child externalising behaviour. The quality of the mother-child relationship was the strongest mediator in the relationship, and for boys

the relationship was weaker in the context of a good quality father-child relationship and mother-father relationship.

Conclusions: The thesis adds to evidence of the longitudinal association between maternal psychological distress and child externalising behaviour in the early years. Gender differences were found for the association, including differences in lifecourse and family relationship effects.

Acknowledgements

There are a number of people I would like to thank for the support they have provided during my doctoral studies. Firstly, my sincere thanks to my supervisors Dr Anne McMunn, Professor Yvonne Kelly and Dr Saffron Karlsen, who have consistently and unerringly encouraged, guided and supported my efforts, in addition to providing invaluable advice and insights. My thanks also to Dr Hynek Pikhart, Dr Paola Zanninotto, Dr Mai Stafford and Dr Jenny Head of the Research Department of Epidemiology and Public Health for the exceptional training in statistics they provided, along with ongoing advice during my doctorate. I am grateful to have been an affiliate member of the International Centre for Lifecourse Studies in Society and Health (ICLS) during my doctoral studies, and have valued the intellectual and social support this has provided. I would like to thank my fellow doctoral students for generously offering their help, encouragement and support throughout this endeavour, especially those closest – i.e. PhD study room 350 – as well as those further away in proximity but not in generosity. My heartfelt thanks go to my long-suffering family and friends, who have offered help and support through countless sources, practical, emotional and spiritual. In particular to Tim, my husband, who provided support above and beyond the call of duty to keep house and home and wife afloat, thank you. Lastly, I would like to acknowledge the Medical Research Council (MRC) and University College London (UCL) doctoral training grant system for financial support, without which I could not have undertaken this thesis.

Contents

List of Figures

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

List of Boxes

Chapter 3

List of Tables

Chapter 4

Chapter 5

Chapter 6

Acronyms and abbreviations

CAPI	Computer-assisted personal interviewing
MCS	Millennium Cohort Study
ONS	Office for National Statistics
SDQ	Strengths and Difficulties Questionnaire
DWP	Department for Work and Pensions
UK	United Kingdom
FSM	Family stress model
K6	Kessler Six
PPCT	Process-Person-Context-Time model

Chapter 1: Child externalising behaviour and maternal psychological distress

1.1 Introduction

Child externalising behaviour difficulties are increasingly viewed as a public health problem, not least because of their association with poorer educational and economic outcomes, teenage pregnancies and later criminality.[1;2] Externalising behaviour difficulties which emerge in early childhood often persist over time and present risks for later development and adult functioning.[3-5] Mothers are often seen as the guardians of their children's health and development, and the health of the mother as a major determinant of the health and development of their child.[6] This is the case for mothers' psychological health, and evidence of the relationship between maternal depression and child socio-emotional behaviour is well documented.[7-18] With worrying projections of rising rates of depression globally,[19-21] together with the almost universal acceptance of maternal depression as a determinant of child socio-emotional behavioural development, the relationship between maternal and child mental health must be kept on the research agenda. An investigation of the relationship between child externalising behaviour and maternal psychological distress is the focus of this thesis

This first chapter of the thesis begins by presenting the relevant background information on child externalising behaviour and maternal psychological distress, including the extent of these phenomena and how they are conceptualised. Next, the evidence of the relationship between child externalising behaviour and maternal psychological distress is reviewed. This review is structured around three theoretical models: Bronfenbrenner's bio-ecological systems theory, lifecourse theory and the family stress model (FSM). These three models theoretically inform the

conceptualisation and investigation of the relationship between maternal psychological distress and child externalising behaviour. Each model frames a section of the review, and each section begins with a description of the model followed by a summary and appraisal of the associated literature on the relationship between child externalising behaviour and maternal psychological distress.

1.2 Child externalising behaviour

Child externalising behaviour is the outcome of interest in this thesis. From a developmental perspective, child externalising behaviour forms part of the broader concept of child socio-emotional development. Child socio-emotional development is itself part of the wider domain of early child development, the other two parts being physical and cognitive development.[22] The majority of child mental disorders fall under the domain of socio-emotional development. Some of the most common disorders include conduct problems, hyperactivity, anxiety and depression. Child externalising behaviour is a construct which combines symptoms from both conduct disorder and hyperactivity. Another commonly used construct, similar to child externalising behaviour, is that of disruptive behaviour. Disruptive behaviour refers to a combination of symptoms from both oppositional defiant disorder and conduct disorder. Disruptive behaviour is distinguished from externalising behaviour here as it is referred to in the review of the literature.

1.2.1 The extent of the problem

Estimates of the worldwide prevalence of child mental disorders have found child disruptive behaviour (ODD/CD) to range from 5 to 10%, and hyperactivity to range from 1 to 5%.[23] These wide ranges in worldwide prevalence estimates are largely accounted for by the wide age ranges and different populations of children included in studies, along with the use of different measures of and diagnostic criteria for child disorders.[24]

The UK has a long history of surveillance of adult psychiatric morbidity; however, the first survey of child and adolescent mental health was conducted relatively recently, in 1999.[23] The primary purpose of this survey was to identify the prevalence of three main categories of child mental disorder: conduct, emotional and hyperactivity disorders. Stringent criteria were used to ascertain 'caseness' based on the ICD-10 (International Classification of Diseases, tenth revision) and DSM-IV (Diagnostic and Statistical Manual, fourth revision) in a large UK population of children aged five to 15 years. The survey found a prevalence of all child mental disorders of approximately 10%, with a prevalence of conduct disorders of 5% and hyperactivity disorders of around 1%. In addition, significant differences in prevalence of disorder by age group and gender were found.[25] For example, prevalence of conduct disorders in the five-to-10-year-old age group was 4.6%, compared with 6.2% in the 11-to-15-year-old age group.[23] Hyperactivity prevalence was consistent across both the younger and older age groups of children at 1.5%. Gender differences in prevalence were found in both the younger and older age groups of children, with boys having a markedly higher prevalence of conduct and hyperactivity disorders compared with girls. In the five-to-10-year-old age group, the prevalence of conduct disorders was 6.5% in boys and 2.7% in girls, and of hyperactivity disorders was 2.6% in boys and 0.4% in girls.

Child mental disorder prevalence has also been found to vary considerably by social and economic circumstance.[26] On the whole, higher rates of child mental disorder are found to occur in the context of socio-economic disadvantage. For example, in the UK survey of five-to-10-year-old children, the prevalence of conduct disorders ranged from 3% in families where the parent had degree-level qualifications to 13% in families where the parent had no qualifications.[23] Similar inequalities in child mental disorder prevalence have been found for both conduct and hyperactivity disorders and across a broad range of socio-economic position indicators, such as family structure, income and housing tenure.

1.2.2 Conceptualising child externalising behaviour

The earliest studies of 'normal' child behaviour and development emanated from the field of developmental psychology. However, since the early 21st century, alongside advances in medical science through genetics, neuroscience and pharmacology, 'problem' child behaviour has largely become the domain of psychiatrists. Consequently the medical model dominates as the main explanatory model of child socio-emotional behavioural problems in the western world. The medical model views problem child behaviour as a 'disorder' to be cured. Within this model, medical doctors act as the arbiters of the diagnosis of disease and are trained in the identification of sets of symptoms and their consequent classification into a 'syndrome'. If the appropriate combination, number and severity of symptoms is found, then a diagnosis is made. Following diagnosis, treatment can be prescribed, often in the form of pharmacotherapy. To aid the classification of disease and reduce the subjectivity of diagnosis, two main classification systems have been devised. The International Classification of Diseases (ICD), currently version 10 (ICD-10), is the international standard diagnostic classification for general

epidemiological, health management and clinical use.[27] The second diagnostic classification system, which is specific to mental disorder, is the Diagnostic and Statistical Manual of Mental Disorder (DSM-IV), which is published by the American Psychiatric Association, the professional organisation representing United States psychiatrists.[28] These two classificatory systems are similar, and each undergoes regular updating, particularly in the area of mental disorder, which is complex and prone to subjectivity. The knock-on effect for mental health research is that studies which use measures of mental disorder informed by earlier versions of the classification system, or by the different systems, may not be comparable, and are prone to become out of date relatively quickly.[29]

In line with this disorder model, the identification of child externalising behaviour problems is based on the observation and classification of symptoms. However, many of the symptoms used to classify child mental 'disorder', if taken in isolation, are common to most children at one time or another. Hence child psychiatrists stress that a diagnosis of 'disorder' requires that the symptoms have a substantial impact, such as social impairment, distress to the child or disruption to others. It is also recognised that this process is open to cultural, societal and individual bias and the propensity to label deviant behaviour as a disorder.[25] In the case of very young children it is parents, or sometimes other key adults such as health visitors (in the UK), who inevitably must distinguish between 'normal' and 'abnormal' child behaviour, and this is influenced by their cultural and societal norms, health or social circumstances.

From a medical model perspective, child externalising behaviour combines symptoms indicative of conduct disorder and attention deficit hyperactivity disorder or hyperactivity.[28;30] Child externalising behaviour symptoms include a broad range

of behaviours, most of which are manifested outwardly, with often negative impacts on the child's external environment.[31] Conduct disorder is defined as persistently high levels of fighting, lying, bullying, vandalism and other antisocial behaviours during childhood and adolescence, succinctly described as 'the persistent failure to control behaviour appropriately within socially defined rules'.[25] Hyperactivity is defined as developmentally inappropriate levels of attention problems, motor hyperactivity and impulsive behaviour. There is ongoing debate within the field of psychiatry around the extent to which conduct disorder and attention deficit hyperactivity disorder are distinct. One early review of this evidence (in 1987) concluded that the two classifications were distinct, although highly correlated.[30] Many psychiatrists maintain that each 'disorder' has clearly distinguishable behavioural features and, to some extent, different outcomes.

The social construct of child externalising behaviour is often associated with 'antisocial' behaviour, although it is largely viewed as a less severe form of antisocial behaviour.[32] This may partly correspond with the tendency to view externalising behaviour problems as problems occurring in very young children, and hence as less serious than those in later childhood, which are more likely to be associated with conduct disorder, later criminality and violence in boys, and academic and psychiatric problems and early sexual behaviour in girls.[2;33-35] This view is largely misguided, as early externalising behaviour problems are often the forerunner of these 'more serious' conditions. This highlights the importance of the early years as a potentially critical period for intervention which might have long-lasting positive effects.[36-41] Another reason why child externalising behaviour is seen as less problematic than antisocial behaviour may be that it incorporates hyperactivity symptoms, which on the whole are seen as less socially challenging than conduct symptoms, thus diluting the perceived severity of externalising behaviour.[42] In

respect of developmental outcomes, children with hyperactivity symptoms appear to have a lower risk of antisocial behaviour outcomes compared with children with conduct problems, although they are at a higher risk than children with no hyperactivity.[43] Nevertheless, co-morbidity is common for children exhibiting conduct or hyperactivity problems, and this is associated with more severe and continuing problems.[44]

The medical model, in line with a diagnostic approach, tends to focus on identifying cases to compare with non-cases for the purposes of epidemiological and medical research. However, it is known that many children have significant symptoms that do not meet diagnostic criteria, but which nevertheless pose a risk for their future development.[45] With this as well as the subjectivity associated with classifying mental disorder in mind, I would argue that child externalising behaviour as a social construct is better understood as a continuum of symptoms. This conceptualisation is supported by more recent research which has explored the extent to which measures of child mental health can distinguish between 'disorders' in low-risk population samples and the monotonic nature of child externalising behaviour.[46-48] This recent research also supports the conceptualisation of child mental 'disorders' within broader dimensions, such as externalising behaviour particularly for use in younger, low-risk cohorts. Hence this thesis uses a continuous scale of child externalising behaviour symptoms as the main outcome measure.

In summary, we find that child externalising behaviour is a construct which combines symptoms from both conduct disorder and hyperactivity. It is now viewed as a public health problem, not least because of its association with poorer later-life outcomes. Externalising behaviour appears to be socially patterned, occurring to a greater degree in the context of socio-economic disadvantage, and in addition boys have

higher rates of conduct and hyperactivity disorder than girls. The conceptualisation of child externalising behaviour for the purpose of this thesis treats it as a continuum of symptoms, and this approach is supported by recent research which has found evidence of the monotonic nature of child externalising behaviour.[46-48]

1.3 Maternal psychological distress

1.3.1 The extent of the problem

Although there is a conceptual delineation between psychological distress and depression, the research literature often uses the terms synonymously, in particular when describing self-reported depressive symptoms. The extent of the problem of depression is described here. Depression is a growing worldwide problem, and is among the most prevalent of all mental disorders.[49] In 1990 the World Health Organization (WHO Global Burden of Disease Study) ranked depression as the fourth leading cause of worldwide disability-adjusted life years (DALYS) for both men and women.[21] Projections of mortality and burden of disease for the year 2030 rank depressive disorders as the leading cause of DALYS in the world. This is largely as a result of years lived with disability, as opposed to years of life lost. Figures for the UK suggest that one in six (16.5%) of the adult population has anxiety or depression, compared to one in 200 with a psychotic disorder such as schizophrenia.[50;51] In addition, mental health problems are more likely to persist when they coincide with socio-economic disadvantage. Gender differences in depression are apparent, with women reported to be around two thirds more likely than men to become depressed, although these differences appear to be declining over time.[52;53] Over a lifetime one in five women, compared to one in ten men, will experience a depressive episode.[3] This gender difference is clearly marked out by

adolescence and reaches a peak during the reproductive years.[54;55] This peak is likely influenced by the period of motherhood, which has been identified as an especially vulnerable time.[3] A meta-analysis of maternal post-natal depression studies reported that on average 13% of mothers experience depression.[56;57] This high prevalence appears to be associated with events related to pregnancy, such as preterm birth, unplanned pregnancy and stillbirth, which may increase a mother's risk of depression. For example, preterm delivery of a very low birthweight baby (<1,500g) has been found to be associated with higher levels of maternal psychological distress at six months (56%) compared with mothers of term babies (35%), although these differential effects appear to dissipate by two years.[58] Other factors associated with an increased risk of depression in motherhood include family size, twin or multiple births, close spacing of births, ill health of the child, and child behavioural difficulties.[59;60]

1.3.2 Conceptualising maternal psychological distress

Psychological distress is a concept largely used within the context of epidemiological population surveys to describe a group of symptoms indicative of mental disorder, in particular depression and anxiety.[61] Measures of psychological distress typically consist of a range of heterogeneous symptoms, including cognitive, behavioural, emotional and psychophysiological symptoms. Despite the heterogeneity of these symptoms, researchers have found that people with a wide range of mental disorders commonly have high scores on one core dimension of psychological distress.[61] More commonly, researchers assign the term 'psychological distress' primarily to symptoms of depression and anxiety, and indeed very high psychological distress has been shown to be a very good indicator of mood and anxiety disorders, in particular depression.[61-63] For research purposes the

concept of psychological distress enables a less clinical approach to depression and anxiety symptoms than the identification of 'caseness'. As with child externalising behaviour, psychological distress is suitable for use as a continuous measure focusing on a gradient of symptoms. This is helpful, as it is known that the majority of people with depression do not seek treatment for it and remain undiagnosed.[64] Conceptualising psychological distress as a gradient of symptoms is the approach used in this thesis.

Researchers often assign the term psychological distress or depression to the same group of symptoms. However, more is known about depression and this may be helpful for understanding psychological distress. Depression[1] as a diagnosis covers a range of mood disorders on which there is disagreement among psychiatrists concerning their classification.[27] Broadly, depression is a disorder of mood, defined as a change in mood to depression, which is usually accompanied by an overall change in levels of physical activity. Depression tends to be recurrent and is often related to stressful situations or events. In addition, the severity, duration and frequency of depressive episodes vary considerably. With regard to post-natal depression, the ICD-10 suggests that mood disorders associated with the puerperium[2] period do not vary sufficiently to warrant a special category and therefore should be categorised as a depressive disorder.[65]

In summary, psychological distress is a concept most often used in the context of measuring mental health within epidemiological population surveys, and describes a

[1] Also referred to as unipolar depression, to distinguish it from the bipolar mood disorders.

[2] The puerperium covers the six-week period following birth

group of symptoms indicative of anxiety and depression.[61-63] It can be used as a continuous measure of symptoms, and indeed may be more suited to a low-risk population sample. In the research literature the term 'psychological distress' is often used synonymously with depression. Depression is a growing worldwide problem, and around one in six of the adult UK population has depression or anxiety, with the majority of these remaining undiagnosed.[50;51;64] Women are more at risk of depression than men, and depression peaks in the reproductive years, likely as an effect of motherhood.[52-55] This growing prevalence in depression highlights the need to continue to investigate the impact of maternal depression on child development outcomes, and in this thesis the association between maternal psychological distress and child externalising behaviour constitutes the focus of investigation.

1.4 The relationship between maternal psychological distress and child externalising behaviour

1.4.1 Overview of the evidence

There is now a substantial body of evidence, spanning five decades of research, documenting a significant association between maternal psychological distress, in particular maternal depression, and child socio-emotional behaviour and developmental outcomes.[7-17;66;67] An early review of this evidence found that children raised by a psychologically distressed parent were considerably more likely to have socio-emotional behaviour problems than children raised by a non-psychologically distressed parent.[13] Research has found that the effects of exposure to maternal depression during childhood can be long lasting. For example, a follow-up study

which recruited severely depressed mothers with a child aged between six and 23 years old, and matched controls, found that 20 years later the children of the depressed mothers were three times more likely to have an anxiety disorder, major depression or a substance misuse problem, compared with the children of non-depressed mothers (the matched controls).[16] In addition, these problems had appeared early in life and continued through adulthood. Research has also found that exposure to maternal depression is associated with negative impacts on a wide range of child socio-emotional behaviour and developmental outcomes, and these effects are consistently long lasting.[5;17] The timing of exposure to depression is less well explored in the literature, although there appear to be similarly negative effects on child socio-emotional and behavioural problems whether the child is exposed in the post-natal period or at other periods in childhood.[12;68-70] Another area of investigation, less well explored but now experiencing an upsurge in interest, is the effect of fathers' psychological distress on child outcomes. One such study investigated the effects of exposure to mothers' and fathers' psychological distress on girls' and boys' socio-emotional adjustment at five years old using an England-only subsample of intact two-parent families from the UK Millennium Cohort Study.[71] The study found that poorer socio-emotional adjustment was associated with higher parental psychological distress, although after controlling for the parents' age and socio-economic status this association remained significant only for maternal psychological distress. The strength of the effect of maternal and paternal depression on child internalising and externalising behaviour has been investigated. A recent meta-analysis of 193 studies found that the age of the child was related to the magnitude of the association between mother's and father's depression and internalising and externalising behaviour.[17] The association between fathers' depression and internalising and externalising behaviour was stronger in older children, whilst the association between mothers' depression and internalising and

externalising behaviour was stronger in younger children. However, the researchers noted that these associations were significantly moderated by theoretically relevant variables such as family income and family structure – although only the unadjusted relations were reported, due to the heterogeneity of the studies, and therefore the findings could be the result of confounding factors.

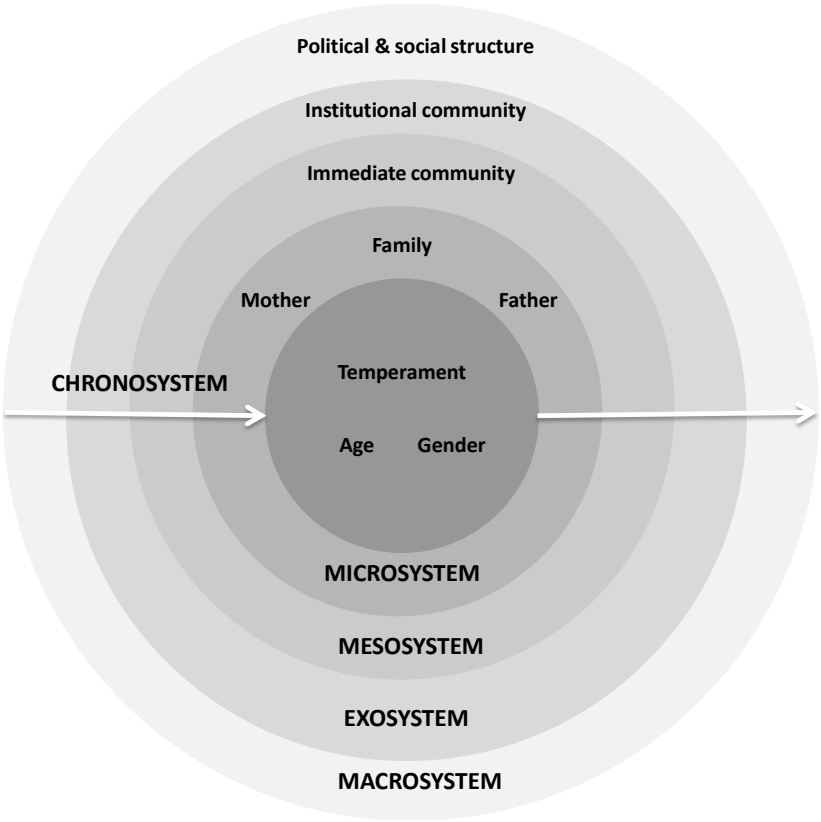
From this overview of the research literature there appears to be substantial evidence of an association between maternal psychological distress or depression and child socio-emotional behavioural outcomes, including externalising behaviour. In addition, the effects of exposure to maternal psychological distress appear to be long lasting. Some gaps in this body of research are apparent: the effects of the timing of exposure to psychological distress, the role of fathers, and the investigation of potentially important moderators and mediators such as gender, family income and family structure. It is at this point that the three theoretical models used to inform this thesis are introduced: Bronfenbrenner's bio-ecological systems theory, lifecourse theory and the family stress model (FSM). These three models help to further conceptualise the relationship between maternal psychological distress and child externalising behaviour by highlighting some of the potential causal connections and processes which may be operating. Each model forms the focus of a section of the following literature review, beginning with a description of the model, followed by a review of the literature highlighted by the model as potentially theoretically significant for the relationship between maternal psychological distress and child externalising behaviour.

1.4.2 Bio-ecological systems theory and the relationship between maternal psychological distress and child externalising behaviour

The bio-ecological systems theory is a model of human development created by the psychologist Urie Bronfenbrenner.[72;73] Originally conceived in 1979 as the ecological systems theory, Bronfenbrenner's theory has undergone several developments since its conception, the most recent (2000) being called the Process-Person-Context-Time model (PPCT). However, following on from – and probably better known than – his original ecological systems theory, Bronfenbrenner's bio-ecological systems theory incorporates an additional biological dimension. Bronfenbrenner's theory proposes that every child develops within a complex system of relationships affected by multiple nested levels of the surrounding environment. This environment includes and extends beyond the home, school and neighbourhood settings, with each layer having a powerful impact on development.[72] Bronfenbrenner originally identified four levels of the child's environment, which he called the microsytem, mesosystem, exosystem and macrosystem, illustrated as nested concentric circles (see Figure 1.1). Firstly, the innermost microsystem consists of the activities and interactions in the child's immediate social and physical environment. These interactions are characterised by bidirectional relationships with parents and siblings, particularly in the early years, with reciprocal exchanges occurring over time and often having a foundational and enduring impact on development.[72;74] Simultaneously, third parties also affect the quality of these reciprocal relationships. The later bio-ecological systems theory, which included a biological element, is positioned in the model within the child as an innermost level within the microsystem. The second-level mesosystem includes interrelations with various settings in the immediate environment such as the home, school, neighbourhood or children's centre. At the third level or exosystem, the child is influenced indirectly by events and social settings in which he or she is not present: for instance, formal

organisations such as the parent's workplace, religious institutions, and health and welfare services. The exosystem is in turn influenced by the fourth and outermost level or macrosytem, which comprises cultural values, laws, customs and resources.

Figure 1.1 Illustration of Bronfenbrenner's bio-ecological systems theory



In Bronfenbrenner's most recent adaptation of his theory, the PPCT model, the concepts of 'process', 'person' and 'time' were added.[75] Process refers to something that potentially explains the link between context and child outcome, described as the 'engine of development'.[73;73;76] For example, in this thesis parenting is proposed as a 'process' which might explain the link between maternal psychological distress

and child externalising behaviour. With respect to process, Bronfenbrenner distinguishes between ‘proximal’ and ‘distal’ processes. Proximal processes are those occurring within the child’s immediate environment, and are perceived as having the most powerful impact, particularly in relation to the frequency with which they occur. One example of a proximal process would be playing with a child. Distal processes occur outside of the immediate external environment, such as in the broader culture, and modify the proximal processes. The person element of the PPCT model refers to the characteristics of the individual, such as gender, age and temperament, and the model acknowledges potential biological and genetic influences on the person. These person factors are important in this thesis, and are discussed later in this section. The PPCT model has the additional conceptual level of time, called the chronosystem. The chronosystem refers to time in history, as well as to the consistency of processes and the timing of transitions across the lifecourse.

In the early years of a child’s life, their immediate surroundings are likely to be dominated by the nuclear family and the home. The focus of this thesis is on influences and experiences occurring within the child’s immediate surroundings, the microsystem. However, applying Bronfenbrenner’s theory helps us to retain the perspective that conceptually more distant levels of the environment are likely to impact on the child via the microsystem. For example, maternal psychological distress is experienced by the child at the microsystem level; however, evidence suggests it is likely to be affected by socio-economic disadvantage, which in turn is influenced by wider macroeconomic policies emanating from the macrosystem.

At the microsystem level, the mother-child dyad is potentially the most influential relationship in early development. This fits with Bronfenbrenner’s theory of proximal processes, which stipulates that for an interaction to have the most powerful effect it

must occur on a regular basis over extended periods of time. The earliest, most primary interaction and influence in a child's early life is likely to be with the mother as the direct provider of nutritional and physical sustenance, comfort and safety, as well as of emotional nurturance and cognitive stimulation. Despite societal changes toward more flexible approaches to early-life childcare, the mother remains the dominant provider of care throughout the child's early life[77] and is therefore often the most influential person in early development. Consequently, much research has been and continues to be focused on the mother-child dyad, and this is also the case in this thesis.

Developmental theorists have long been proponents of the transactional nature of the mother-child relationship.[73;78;79] According to Bronfenbrenner's theory, the relationship between maternal psychological distress and child externalising behaviour is bidirectional, in addition to being influenced by the complex, multilayered and changing environment in which it occurs.[72;80;81] Despite this, the vast majority of research exploring the association between maternal psychological distress and child socio-emotional and externalising behaviour has focused on potential mother-to-child effects. Even so, mothers often attribute their higher levels of depressive symptoms to child-related stress, predominantly as a result of child psychological and behavioural problems.[82] More recent research has emerged which examines the bidirectional effects between maternal psychological distress and child socio-emotional behaviour. One such study followed adolescent mothers and their firstborn child at intervals from three to 10 years old to explore the reciprocal relationship between maternal depressive symptoms and child externalising behaviour.[83] The researchers found strong evidence of a dose-response relationship for the mother-to-child effects, in that as maternal depressive symptoms increased or decreased, children's behaviour problems increased or

decreased commensurately. The reciprocal effects, although significant, were not as integral to the model, and this suggested a weaker effect from child to mother. Another study followed 61 mother-and-child dyads from the age of three to nine years to examine the effect of positive and negative child behaviour on the course of maternal depression.[84] Here the researchers found evidence of a small bidirectional effect from child to mother and mother to child, which supported an interactionist model of development. A third study recruited mothers and sons at age 18 months to explore the relationship between maternal depressive symptoms and antisocial behaviour at intervals from age five to 15 years.[85] In this study evidence was found of mother-to-child and child-to-mother effects of equal strength, although this might be explained by the type of child behavioural outcome investigated, which may be more distressing to parents than externalising behaviour. All of the studies mentioned were conducted on small samples (>500), one of which was of boys only; two sampled only disadvantaged families, and the other sampled only mothers with childhood-onset depression. Results from these studies are therefore not generalisable to a wider population.

Bronfenbrenner's most recent PPCT model highlights person characteristics as important to development outcomes. Gender is defined by Bronfenbrenner as a 'demand' characteristic, described as having an immediate stimulus effect on the environment and relationships. Despite evidence of significant differences in the prevalence of child externalising behaviour by gender,[23;86] only a few studies have explored potential gender differences in the association between maternal psychological distress and child externalising behaviour. One prospective cohort study looked at the association between maternal depression in early childhood and child externalising behaviour in the late teenage years by gender.[87] Researchers found that elevated maternal depressive symptoms predicted increased

externalising behaviour symptoms in boys, but not girls, at age 17 years, although only when occurring together with low impulsivity at age five years. Conversely, a cohort study of Ukrainian boys and girls aged 10 to 12 years (n=544) found an association between maternal depression and externalising behaviour in girls but not in boys.[88] This lack of research exploring gender differences in the relationship between maternal psychological distress and child externalising behaviour may be partly due to the small sample sizes used in many of the studies investigating this relationship, which do not allow the adequate testing of effect modification by gender because of insufficient statistical power or subsequent gender-stratified analyses.

Another type of person characteristic mentioned in Bronfenbrenner's PPCT model are 'force' characteristics.[75] Force characteristics are deemed important to development because they can affect it independently of other characteristics. One force characteristic relevant to this thesis is that of child temperament, with a growing body of evidence supporting its importance in developmental pathways. Child temperament refers to individual differences in activity, emotional reactivity and attention which support self-regulation.[89] Temperament is thought to be in part biologically or genetically determined, as well as influenced by environmental factors.[90] Research has found an association between certain types of temperament in young children and later externalising behaviour problems in adolescence, in particular those related to a lack of control.[91] It is proposed that in young children the combination of a certain temperament with a non-optimal environment plays a role in the development of child behavioural difficulties.[92] In the relationship between maternal psychological distress and child externalising behaviour, it may be that child temperament, along with maternal psychological distress, impacts on parenting, which in turn affects child behaviour. For example, a child with an irregular temperament may elicit harsher parenting behaviour, which in turn may be

modelled by the child, ultimately leading to increased aggressive behaviour in both parent and child.[93] This cyclical pattern of reinforcing negative behaviours has been the focus of coercion theory.[93;94]

The final component of Bronfenbrenner's theory that is of importance to this thesis is the concept of time, the chronosystem. The thesis research consists of a longitudinal analysis of the relationship between maternal psychological distress and child externalising behaviour, and therefore the conceptualisation of potential time-related effects is important. To date, however, the time component of Bronfenbrenner's theory has not been explicitly developed, and hence lifecourse theory is used to inform this aspect of the thesis, as it provides an explicit framework of concepts relating to the timing of events and periods of transition. In the next section lifecourse theory is briefly described, and the evidence relating to possible lifecourse effects in the relationship between maternal psychological distress and child externalising behaviour is reviewed.

1.4.3 Lifecourse theory and the relationship between maternal psychological distress and child externalising behaviour

The timing of events and stressors in a child's life, as well as the wider historical context in which a child is raised, are thought to be influential in a child's developmental pathway, and consequently on later-life health and well-being. Lifecourse theory and lifecourse epidemiology refer to slightly different but complementary approaches to examining and explaining the effects of events and transitions in people's lives, and each will now be described in turn.

Lifecourse theory developed alongside the USA's seminal longitudinal studies of the 1920s and 1930s, such as the Oakland Growth Study (birth years 1920–21) and the

Berkeley Guidance Study (birth years 1928–29). Lifecourse theory expanded on theories of child development to incorporate the link between early childhood circumstance and experiences and later adult outcomes.[95] Four key principles emerged from this research: firstly, location in time and place, which refers to the historical, social and cultural structures and events that shape people's lives over their lifecourse; secondly, the timing of lives, which refers to the timing of events or life transitions, which is of importance to the impact these have on development and health; thirdly, the linked lives principle, which describes the interdependence between individuals, societal institutions and social groups; and fourthly, human agency, which refers to the individual's role in the construction of their own life through choice, within the constraints of their historical and social setting.[96]

In the UK, four cohort studies (1946, 1958, 1970 and 2000) have led to British social and medical scientists' substantial contributions to lifecourse research, and to the more recent development of lifecourse epidemiology.[81;97] From an initial focus on 'biological programming', which featured the hypothesis that exposures during critical growth periods *in utero* had long-term effects, lifecourse epidemiology now spans the age ranges and acknowledges that both biological and social factors throughout life independently and cumulatively influence health and disease in adult life.[39;81;97;98] Lifecourse epidemiology is concerned with exploring the effects of biological, social and environmental exposures on health, from gestation and infancy across the lifecourse, and even across generations.[99] From lifecourse epidemiology three main interrelated models of lifecourse influences have emerged: sensitive period, accumulation and pathways.[39;81;97;98] The sensitive period model supposes there are periods of development, in particular in early life, during which exposures to adversity will have more serious or long-term effects.[100] This expands on the *in utero* 'biological programming' hypothesis to incorporate the entire lifespan, although

the importance of early life events is still acknowledged. The timing of important life transitions, such as the early-life transition to formal education, or in women the transition to motherhood, remains a focus of lifecourse research. The accumulation model proposes that as the number, intensity and duration of exposures to unfavourable or favourable physical, social or psychological environments or events increase, effects accumulate to impact on health in a dose-response way.[101;102] The pathways model, sometimes called the 'chain of risk model', refers to a sequence of linked exposures, with an early exposure potentially increasing the risk of a subsequent exposure and hence setting a person on a pathway to a later outcome of disease or disadvantage.

Research examining the lifecourse effects of maternal depression on child socio-emotional behaviour has emerged over the last decade, although it is relatively sparse and heterogeneous. A cohort study of nearly 5,000 children living in Australia explored the relationship between the severity, chronicity and timing of maternal depressive symptoms with child behaviour at age five.[103] The study measured self-reported maternal depressive symptoms during pregnancy, postpartum, and when the child was six months and five years old. Results suggested that the severity, chronicity and temporal closeness of maternal depressive symptoms were all related to increased behaviour problems at age five. Another small prospective study of 175 mother-and-child dyads examined the effects of major maternal depressive disorder in the first year of a child's life on child externalising behaviour measured once over the first 12 years of life (mean age 4.91 years).[104] In this study researchers found that maternal depression during the prenatal period (pregnancy) did not predict later child externalising behaviour, whereas depression in the first year of life did. Similar results have been found in a prospective study of 1,116 British twins, which assessed the relationship between maternal depression and child antisocial

behaviour at age five and seven years.[105] In this study researchers found that depression after, but not before, the birth of the twins was associated with antisocial behaviour at age five and seven years, even after adjusting for significant maternal characteristics such as antisocial personality. The study also found that a combination of both maternal depression and maternal antisocial personality posed the greatest risk for later antisocial behaviour in the child, perhaps indicative of a chain of risk or cumulative effect of these maternal risk factors.

There is some evidence to suggest that the timing of exposure to maternal depression may affect boys and girls differently. For example, a community-based prospective study examined the relationship between maternal depression, negative parental behaviours and boys' and girls' externalising behaviour at 24 months and at six to seven years old.[93] In this study researchers found evidence of a stronger relationship between maternal depression, negative parental behaviours and externalising behaviour at 24 months in boys compared with girls. By six to seven years old, the strength of the relationship between maternal depression, negative parental behaviours and child externalising behaviour had decreased in magnitude for boys but increased in magnitude for girls, so that the relationship was stronger for girls compared with boys. In addition, the relationship between mother's negative parental behaviour, specifically hostility, at six to seven years old and concurrent externalising behaviour symptoms was stronger for girls. This evidence appears to suggest that the relationship between maternal depression and child externalising behaviour is stronger for boys in early childhood, and stronger for girls in later childhood and adolescence. In addition, studies of older children (10–12 years old) have found an association between maternal depression and externalising behaviour in girls but not in boys.[88] A study of children from high-risk families exposed to maternal depression in infancy found that boys were more at risk of

externalising behaviour problems at kindergarten, whereas girls were more at risk of internalising problems in later childhood.[106-108] This evidence on the whole seems to support the hypothesis that boys may be more sensitive to exposure to maternal psychological distress up to the age of five years, whereas girls may be more sensitive to exposure to maternal psychological distress in later childhood and adolescence, although the effect on girls may be manifest in either externalising behaviour or internalising problems.[106-108]

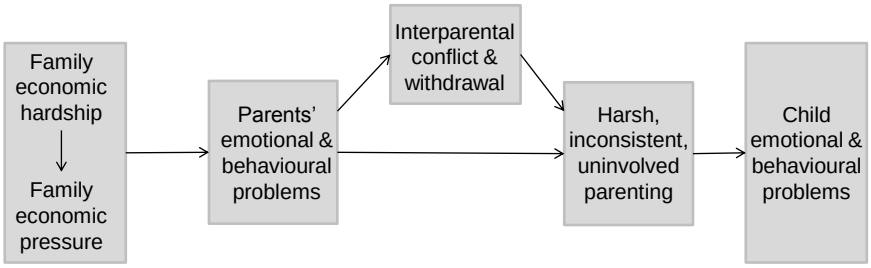
For the purposes of this thesis, Bronfenbrenner's theory of development, together with the lifecourse approach, offers a useful framework from which to explore and understand aspects of the relationship between maternal psychological distress and child externalising behaviour. However, these models do not expound the potential mechanisms and processes involved in this relationship.[109] One theoretical model which attempts to portray a possible pathway from maternal psychological distress to child socio-emotional behavioural outcomes is the family stress model (FSM).[18;80;110] The FSM is the third theory to inform this study, and is described next.

1.4.4 The family stress model and the relationship between maternal psychological distress and child externalising behaviour

The family stress model (FSM) portrays a pathway triggered by economic disadvantage, in particular feelings of economic pressure, which leads to psychological distress in parents, instability in romantic relationships, and less sensitive, nurturing and responsive parenting (Figure 1.2).[111;112] This pathway ultimately impacts on child development outcomes. The FSM developed from research originally designed to study normal growth and development using the US cohort studies of the 1920s and 1930s. More than 30 years later the researchers,

Elder and colleagues, realised that the historical context of these cohort studies afforded the opportunity to investigate the effects of the Great Depression,[3] in particular the effect of family economic hardship on child development outcomes.[80;96]

Figure 1.2 The family stress model



From this influential body of work Elder and colleagues, and subsequently Conger and colleagues, developed the FSM.[80;113-115] The original FSM was based on the underlying principle of social causation, whereby social conditions drive variations in health and well-being.[116] This one-dimensional view of the effects of socio-economic hardship on child development has since been rejected by developmental psychologists, who argue that both social causation and social selection operate to influence development across the lifecourse.[117] The social selection perspective proposes that personal traits and disposition influence both the social circumstances and the future emotional and behavioural development of the individual.[116] A further

[3] Originating in the USA in 1929, the Great Depression was a severe worldwide economic depression lasting until the late 1930's or early 1940's.

criticism of the FSM, which originally developed in a context where the nuclear family was the norm, is its lack of account of contemporary changes in family structure, including single-parent, cohabiting and reconstituted families, as well as of changing family structures over time.[118] In response to these criticisms, Conger and colleagues updated the FSM, suggesting that researchers omit parental conflict from the pathway in the case of single-parent families.[116] In addition, the updated FSM proposes that both social causation and social selection operate in the association between socio-economic position and family processes. Despite these criticisms, the FSM remains influential in family research, and many studies exploring the pathway from parental psychological distress to child socio-emotional behaviour are either implicitly or explicitly informed by this model.

Socio-economic position and maternal psychological distress

The first pathway illustrated in the FSM is that between family economic hardship and pressure and parental psychological distress (Figure 1.2).[119] Conger and colleagues suggest that a useful marker of family socio-economic hardship is low income. They propose that low income operates through the economic pressure it generates, such as unmet material needs and the inability to pay bills.[119-121] The experience of these economic pressures then gives rise to increased psychological distress in parents. Indeed, longitudinal studies have found that adults living in poverty are twice as likely to suffer from depression than those not living in poverty.[122] However, research in this area has also found an association between a number of different measures of socio-economic position and psychological distress and depression, including financial hardship, adversity and negative life events,[123] low income,[124] socio-economic inequalities,[125] and family unemployment.[126] Hence the pathway from socio-economic position to child outcomes may be more complex

than is portrayed by the FSM, particularly when considering the effects of different markers of socio-economic position. For example, low educational attainment and financial instability have been linked to marital instability,[127] which in turn is associated with depression.[123] Higher educational level has been linked to marital stability, in part through its effects in terms of increased age at first marriage and having fewer children.[128] Conversely, in the UK there is a trend for the least advantaged women to have children earlier,[129] potentially widening socio-economic inequalities in child outcomes.

There is also some evidence that the FSM may offer a better explanation of the effects of socio-economic position on child outcomes in families living below the poverty threshold, compared with those above it. For example, a longitudinal study which explored the effects of linear changes in income in the FSM pathway on child outcomes found that the relationship between income and child socio-emotional outcomes operated wholly via the FSM pathway in families below the poverty threshold, but not in families above this threshold.[130] There is also evidence that economic hardship and poverty are independently associated with parents' harsher punishment practices and a lower-quality parent-child relationship, as well as poorer child outcomes.[131;132] These direct pathways are not illustrated in the FSM pathway (Figure 1.2). In addition, financial hardship has been found to exacerbate the effects of other stressors on depression, perhaps indicating a potential modifying effect.[133]

More recently, and emanating from the health inequalities literature, a social gradient has been identified[134] for a number of markers of child development,[135-137] including the psychosocial environment.[138] This social gradient in health is hypothesised as impacting on later gradients in health.[139] Indeed, proponents of the social gradient in health suggest that a focus on the most disadvantaged families

may not be adequate to reduce health inequalities sufficiently, and argue for universal action scaled to an intensity proportionate to the level of disadvantage.[41] Little research exists exploring the possible gradient effect of socio-economic position on maternal psychological distress and consequently child externalising behaviour.

As said, the FSM has been criticised for not taking account of differing family structures. Evidence pertaining to the FSM pathway in single-mother families is reviewed below.

Family structure

The FSM has been criticised for its lack of account of change in contemporary family structures, such as single-parent and reconstituted families. This is of importance to this thesis, because around 20% of children in the UK live in a single-mother household.[140] In addition, children of single-parent families on the whole have poorer outcomes compared with children of two-parent families. For example, they report higher levels of school misconduct, externalising behaviour problems, depression and parent-child conflict.[141] A key explanation for poorer child outcomes in single-parent families is socio-economic disadvantage. Single mothers are much more likely to live in socio-economic hardship than two-parent families, and hence to be more psychologically distressed[123;124;126;133] than coupled mothers,[133;142] with consequent effects on child outcomes. Research which has tested the FSM in two-parent and single-parent families appears to support this socio-economic disadvantage hypothesis. For example, one such study found no difference in the FSM pathway by family structure,[143] but another found that differences in child socio-emotional problems could be wholly accounted for by socio-economic

circumstance, with the exception of children living in reconstituted families.[144] The researchers speculated that children in reconstituted families may have more socio-emotional behavioural problems because of exposure to a previous divorce or the introduction of a new parental figure, although the cross-sectional nature of the study did not allow an exploration of this hypothesis.

Although differences in maternal psychological distress and poorer child development outcomes in single-mother families have been largely attributed to socio-economic disadvantage, there is also evidence that other factors play a role in this pathway, in particular social and emotional support.[133;141] For example, one study asked a sample of UK teenage single mothers what 'one thing most helped them when they first became pregnant', with 70% responding that support, both practical and emotional, from their mother, partner or other family member had most helped them.[145] In single-mother households, there is evidence that emotional support can ameliorate the effects of economic hardship on psychological distress.[142] In both single-parent and two-parent families, emotional support has been found to ameliorate the effects of economic hardship on punitive parenting.[121] Perhaps this buffering effect of emotional support acts by enhancing parental psychological well-being, and consequently parenting.[78]

The association between economic hardship and pressure and parental psychological distress is the first pathway illustrated in the FSM. The next pathways illustrated in the model are those from parental psychological distress via parental relationship conflict to harsher parenting, or directly to harsher parenting, and consequently to poorer child outcomes. The following sections discuss the evidence for these pathways.

Family relationships

As said, the FSM initially developed out of research from the 1920s and 1930s in a context where the married couple was the norm, and portrays a pathway which includes relationship conflict as an integral component. There is evidence to support this pathway from parental psychological distress to partner conflict. An association between the quality of the partner relationship and post-natal depression,[146] and depression in women,[147] has been found. In addition, a warm relationship between mother and father has been found to attenuate the relationship between mother's post-natal depression and infant distress, while marital conflict can exacerbate this relationship.[148] However, in a departure from the FSM, research has found that economic hardship and pressure independently impact on the quality of the parents' relationship, as well as via parental psychological distress as portrayed in the FSM.[149] Indeed there is some evidence to suggest that the FSM pathway may only be present for women in couples, and not for men.[150;151] However, this evidence stems from research conducted on married men and women living in very different cultural contexts to those in the Unites States and Europe, which may explain this finding. Both studies proposed that this result may be due to men's greater recourse to social support after work, compared with women in these cultures, who stay at home. In addition, the cultural contexts were ones where families have little recourse to government welfare in situations of decreased family income. A bidirectional association in this component of the FSM cannot be ruled out, as researchers have found evidence that partner relationship quality may also operate to influence psychological distress, which in turn may impact on an adults' ability to deal with economic stress.[152] However, Conger and colleagues have argued against substantial bidirectional effects in the FSM, as they found evidence of the temporal ordering of this pathway in married couples so that economic pressure increased the risk of psychological distress, which in turn increased the risk of marital conflict.[153]

Little research has investigated the FSM in cohabiting couples. One exception is a study which compared the effects of economic circumstance on relationship stability in cohabiting couples compared with married couples, and found similar effects in both couple types.[154]

Parenting

Another important component of the family stress pathway is parenting. Parenting has long been seen as influential on child development, and there is a large body of evidence to support this.[73;74] Parenting as a construct is a largely western-based concept, described as the 'literally hundreds of activities that parents engage in either with, or for, their children'.[135] Early parenting researchers formulated a typology of parenting styles which consisted of three dimensions: authoritative (high-demanding high responsiveness), good enough (medium-demanding medium responsiveness) and unengaged (low-demanding low responsiveness).[155;156] A review of the early evidence suggested that authoritative parenting consisting of high-demanding high responsiveness was the best approach for nurturing mature, prosocial adolescents.[156] More recent parenting researchers have further deconstructed parenting into more discrete behaviours, such as nurturance and warmth, discipline, teaching, language, monitoring, management and materials,[135] and these often form the focus of current parenting research.

In the FSM, parental psychological distress and marital conflict are portrayed as operating through their effects on parenting to influence consequent child outcomes. The evidence suggests that both marital conflict and parental psychological distress increase harsh parenting, which in turn is associated with child externalising behaviour.[18;157] A number of studies have shown that increased negative parenting,

including harshness and coercion, and decreased positive parenting, including warmth and sensitivity, are predictive of child externalising behaviour.[25;44;158;159] Additionally, the effect of harsh parenting on externalising behaviour has been found to be exacerbated when it coincides with a mother-child relationship that lacks warmth.[160] This may not be the complete picture, however, as research has found maternal psychological distress to be independently associated with child behavioural and emotional problems, as well as being mediated by parenting behaviours, although this varies according to the parenting dimension measured and the child outcome.[143] For example, a meta-analysis of studies examining the relationship between parental mental health, parenting behaviour and child anxiety concluded that parenting played only a minor mediating role in children's psychological problems.[161] A longitudinal study which looked at the extent of the role of parenting in the relationship between parent and child psychiatric symptoms, concluded that parenting behaviour must wholly account for this relationship, as children of mothers with a mental illness were only at an increased risk of developing a mental health problem when there was a history of maladaptive parental behaviour.[162]

Of the parenting dimensions studied, the quality of the mother-child relationship appears to have the strongest association with child behavioural outcomes, particularly conduct and hyperactivity problems. A significant association has been found between the quality of mother-infant interaction at birth and the extent of behavioural disturbance at eight years old.[70] The effects of post-natal depression on the early attachment relationship have been found to operate to a large extent through the quality of the parent-child relationship.[68] In addition, it is proposed that parental relationship conflict is likely to spill over into the parent-child relationship,[116] and there is evidence that partner relationship quality plus the severity of the

depressed mother's symptoms together exacerbate the negative effect on the child-parent relationship.[152] There is also substantial evidence that maternal depression impacts on the parent-child relationship, and that, compared with non-depressed mothers, depressed mothers report communication difficulties, lessened affection and experiences of considerable friction with their children.[15;16] This is consistent with more recent research which has shown that depressed mothers are less responsive and feel less positive towards their children than non-depressed mothers,[143] indicating a poorer mother-child relationship among depressed mothers.

Differences have been found in the extent of the mediating role of parenting by type of parenting dimension and child outcome. In addition, differences in parenting effects by gender have been found.[163] There is substantial evidence to support the differential effects of parenting by the child's gender, and gender differences have been found in adolescent externalising behaviour by parent responsiveness,[32;159] the child-parent relationship,[164;165] parental hostility[165;166] and maternal depression.[108;166] The absence of parental warmth has been found to be a stronger predictor of externalising behaviour problems in pre-adolescent[159] and three-year-old boys,[167] as has a lack of maternal responsiveness in infancy, compared with girls.[168] In addition, boys have been found to respond more aversely to maternal control demands, whereas in girls the effect is to reduce aggressive behaviour.[169] Parental hostility and harshness have been shown to have a stronger effect on parent-reported externalising behaviour in boys compared with girls,[170] while physical negativity has been found to be associated with externalising behaviour in boys but not girls.[166] Gender differences in the association between maternal psychological distress, maternal parenting and child externalising behaviour across the early lifecourse (ages two to six years) have also been found. For example, the earlier pathway is stronger in boys, while the later pathway appears stronger in girls.[93] Researchers

have hypothesised that girls' externalising symptoms may be more distressing to mothers than externalising symptoms in boys, and may therefore have a greater impact on maternal parenting behaviours and maternal depressive symptoms over time. Certainly boys' engagement in externalising behaviour may be deemed more socially acceptable than that of girls.[171]

Father effects

Much of the research on parenting focuses on the effects of mothers' parenting behaviour, while research on fathers' parenting effects on child development has emerged more recently. Early findings on the whole suggest that mother effects may be stronger than those of fathers across a range of parenting behaviours. Studies which have compared the quality of the mother-child relationship and maternal depressed mood with that of the quality of the father-child relationship and paternal depressed mood on children's behaviour,[172] and mothers' and fathers' inconsistent discipline on child externalising behaviour, have all found stronger mother-to-child effects.[173] Nevertheless, fathers' parenting does play an important role in child outcomes. For example, researchers have found that less responsive and less sensitive fathering in the first few months is associated with increased externalising behaviour problems in later childhood (age eight and 11 years).[174] Also contributing to this area of research is evidence that the effects of parenting are exacerbated if delivered by a same-sex parent.[175] For example, father negativity has been found to be associated with boys' but not girls' externalising behaviour at home.[166] In addition, harsh and punitive behaviour and a lack of positive fathering, including involvement, warmth and secure attachment, have been found to be associated with the early onset of conduct problems in boys.[176]

1.5 Summary

The focus of this thesis is on the relationship between maternal psychological distress and child externalising behaviour. Although there seems an almost universal acceptance of an association between maternal psychological distress and child externalising behaviour,[7-17;66;67] the combined effects of the rising prevalence of depression and the need to focus on child externalising behaviour as a global research priority (due to its association with poorer development and educational outcomes and even later criminality)[1;177] form the initial justifications for this thesis. Child externalising behaviour as a construct combines symptoms of both conduct disorder and hyperactivity, while maternal psychological distress describes a group of symptoms indicative of anxiety and depression.[61-63] Current understanding of both child externalising behaviour problems and maternal psychological distress is most often framed by a biomedical model.[86] In addition, epidemiological research is often criticised as focusing on biomedical individualism.[109] In contrast, this thesis adopts a more developmental and sociologically informed approach to explore the association between maternal psychological distress and child externalising behaviour. This approach aims to take better account of important evidence pertaining to the influence of the family environment[75] and socio-economic patterning[26] on both maternal psychological distress and child externalising behaviour. In order to take such an approach, the thesis is explicitly informed by three theoretical models: the bio-ecological systems theory, the lifecourse approach and the family stress model. These models propose simplifications of real-life phenomena, none of which can capture real life complexities, but which together present a framework from which to explore the complex relationship between maternal psychological distress and child externalising behaviour. In this chapter the three theoretical models were used to frame the review of the literature. Chapter two begins by drawing this review together and summarising some of the extant

literature reviewed in this chapter in order to highlight the key gaps in the research which this thesis aims to help to fill.

Chapter 2: Gaps in the research, study aim, objectives, hypotheses and conceptual model

Chapter two begins with a summary of the extant literature reviewed in chapter one, identifying gaps in this research. Next, the study aim, research objectives and hypotheses are presented, which aim to help fill the research gaps identified. Lastly, the conceptual model is presented, which illustrates the relationships and pathways between maternal psychological distress and child externalising behaviour to be tested in this thesis.

2.1 Gaps in the research

2.1.1 Continuous measures

Some of the key population-based prospective research studies reviewed in chapter one used measures of maternal psychological distress and child externalising behaviour as dichotomous measures in a case/no case approach.[5;14;69;71] This is in keeping with the dominant biomedical mental health model in the western world. A small number of studies have conceptualised maternal psychological distress and child externalising behaviour as continuums of symptoms, represented as continuous measures.[83;143;178] As a conceptual basis, the thesis aims to adopt a more developmental and sociological perspective to explore the relationship between maternal psychological distress and child externalising behaviour, and the use of measures of both as continuums of symptoms, as opposed to a case/no case approach, is proposed as more in line with this perspective. This approach is supported by recent research which has found child externalising behaviour symptoms to be monotonic in nature.[47;179] The use of continuous measures is also

recommended when assessing child socio-emotional behaviour in low-risk community samples. Hence the thesis predominantly uses the measures of maternal psychological distress and child externalising behaviour available in the MCS as continuous measures.

2.1.2 Bidirectional relationship

Developmental psychologist Urie Bronfenbrenner described the world a child develops in and is influenced by as 'a complex system of multiple and nested levels of the environment acting across time'.[72] Central to this theory is the concept that interactions are characterised by bidirectional relationships which influence each other.[73;78;79] Despite this theory, few studies have explored the potential bidirectionality of the relationship between maternal psychological distress and child externalising behaviour. Those that have done so tend to be conducted using small at-risk populations, and therefore lack generalisability.[83-85] In addition, studies have found different effects, with some finding stronger mother-to-child effects[83;84] and others finding the bidirectional effects to be of equal strength, although in the latter the outcome was antisocial behaviour, which may be more distressing to the mother.[85] This is an important gap in the research, as a bidirectionality effect may bias the results of research on the association between maternal psychological distress and child externalising behaviour by either exacerbating or minimising the effects falsely. This thesis aims to add to the research in this area by using longitudinal data to explore potential mother-to-child and child-to-mother associations between maternal psychological distress and child externalising behaviour at two early time points in childhood: the ages of three and five years.

2.1.3 Timing of events and lifecourse perspective

The timing of events and stressors in a child's life, as well as the wider historical context in which a child is raised, are thought to be influential in the development pathway, as well as on later health and well-being. Earlier studies and subsequent meta-analyses aiming to identify a relationship between maternal psychological distress and child externalising behaviour have often used cross-sectional data on populations of children across wide age ranges.[7;14-16;180] This has resulted in a gap in the research on developmental differences by age, which may also mask key age-related features. Studies which have prospectively investigated this relationship in specific age groups of children have often been conducted on small, case-defined samples, either of mothers with diagnosed depression or of children with diagnosed behavioural disorders; hence results cannot be applied to any population in general.[7;10;15;16;69;70;181-183] Some of the large representative prospective cohort studies which have examined the association between maternal depression and child socio-emotional behaviour in same-age children have focused on child outcomes in middle childhood and adolescence.[5;178;184] The review also found a more recent and growing body of research examining the association between maternal depression and child socio-emotional behaviour using representative prospective cohort studies and focusing on this relationship throughout the early lifecourse.[71;93;103;105;143] However, there is opportunity to build on and add to this body of research by specifically researching the relationship between maternal psychological distress and child externalising behaviour throughout the early years of life. In response to these broad gaps in the research, this thesis uses data from a large prospective cohort of similar-age children, collected as part of the UK Millennium Cohort Study (MCS) and representative of the UK population. In addition, the thesis focuses on the early years of life using data collected at each of the first three waves of the MCS, when cohort children were approximately nine

months, three years and five years old. The MCS is one of the most recently commissioned UK cohort studies; hence the thesis research is historically and contextually relevant.

In this thesis, two lifecourse models are highlighted as potentially important in the association between maternal psychological distress and child externalising behaviour: sensitive period and accumulation. Research exploring potential lifecourse effects, including the timing, severity and chronicity of maternal psychological distress on later child externalising behaviour, has emerged over the last decade. There is some agreement that prenatal maternal psychological distress does not predict later child externalising behaviour, but that exposure in the first few years of life does.[88;104;105] In addition, the severity, chronicity and temporal closeness of maternal psychological distress have been found to be associated with increased externalising behaviour problems at five years.[103] However, a weakness of this evidence is the heterogeneity of the studies with respect to the differing ages of children studied, the different measures of maternal depression and child socio-emotional behaviour used, and the different types of study examining these effects, making comparability difficult. The longitudinal MCS data used in this thesis lends itself to the examination of the effects of exposures over time. Hence the potential lifecourse effect of sensitive periods and accumulation related to exposure to high maternal psychological distress in the early years on child externalising behaviour at age five years is explored.

2.1.4 Socio-economic disadvantage and the family stress model

The FSM is helpful for understanding the potential effects of socio-economic position in the association between maternal psychological distress and child externalising behaviour. It portrays a pathway triggered by socio-economic disadvantage and pressure, leading to increased parental psychological distress, instability in romantic relationships and less sensitive, harsher parenting, resulting ultimately in more negative child outcomes.[111;112;115;185] A review of the literature found strong evidence to support a relationship between financial hardship and depression,[122-126;133] as well as the FSM pathway from economic hardship and pressure to psychological distress, increased partner conflict, poorer and more hostile parenting, and consequent increases in externalising behaviour problems.[119-121] Evidence was also found that economic hardship may affect child outcomes independently of maternal psychological distress, although this varied depending on the outcome measured and the gender of the child.[131;132] The FSM originated from research into the effects of poverty on child development outcomes,[80;114;115;186] and there is some evidence that this pathway better explains the effects of economic hardship in families living below the poverty line than in those above it.[130] This is in contradiction to more recent evidence that has found a social gradient in health, including in a number of child development markers.[134-138] This thesis aims to contribute to this area of research by exploring the role of different markers of socio-economic position in early life, including gradient and poverty measures, in the association between maternal psychological distress and child externalising behaviour at age five years.

The FSM has been criticised for not taking account of changes in family structure in contemporary society. This is important to this thesis, as around 20% of the contemporary UK population is made up of single-parent households, and socio-

economic disadvantage is found to disproportionally affect single-mother households, as does psychological distress.[133;141;142] Research which has tested the FSM in both two-parent and single-parent families has found no difference in FSM pathway by family structure, supporting the idea that apparent differences in child outcomes by family structure may be accounted for by socio-economic position.[143] However, research comparing the FSM by family structure is sparse, and this thesis will add to this body of research by comparing the role of socio-economic position in the association between maternal psychological distress and child externalising behaviour in two-parent and single-parent families.

2.1.5 Pathways: parenting and relationships

The FSM proposes that in couples, economic pressure increases the risk of psychological distress, which in turn increases the risk of relationship conflict.[150] Evidence appears to support an association between the quality of the mother-father relationship and depression,[152;153] with a good-quality mother-father relationship buffering the association between maternal depression and child socio-emotional behavioural problems.[154] In single-parent families, it is thought that emotional support may play a similar role to that of relationship quality in couples, and there is evidence to show an ameliorating effect of emotional support in the association between economic hardship and psychological distress.[142] In addition, in both single-parent and two-parent families, emotional support has been found to buffer the effects of economic hardship on punitive parenting.[121] However, evidence of the potential buffering effect of a good-quality mother-father relationship and emotional support in the FSM pathway is sparse. In this thesis the potential moderating role of mother-father relationship quality in two-parent families, and of emotional support in

both two-parent and single-mother families, in the relationship between maternal psychological distress, parenting and child externalising behaviour will be tested.

Another important component in the family stress pathway is parenting. The FSM portrays psychological distress as impacting on the quality of the mother-father relationship and parenting to influence child socio-emotional behaviour. Although evidence is relatively sparse, it does appear to support the association between a poor-quality mother-father relationship and harsh parenting, which in turn has been found to be associated with child externalising behaviour.[18;157] In addition, there is evidence to support a pathway from maternal psychological distress to parenting behaviours such as increased harsh discipline, decreased warmth and a poorer-quality parent-child relationship, and to child externalising behaviour.[44;143;158-160] This study aims to add to this body of research by examining the mediating role of different parenting dimensions in the association between maternal psychological distress and child externalising behaviour.

Family and parenting researchers emphasise the importance of the role of fathers in child development, and more recently research in this area has emerged. Evidence comparing the effects of mother-child and father-child relationship quality suggest the father-child relationship may not be as influential as the mother-child relationship on child development outcomes.[187] There is, however, evidence that the level of father involvement can buffer the effect of maternal depressive symptoms on child outcomes.[188;189] One recent study which investigated the potential buffering effect of the father-child relationship in the association between maternal psychological distress and child externalising behaviour found none.[187] This is an emerging area of research of contemporary importance, and the thesis will contribute to this evidence by exploring the potential moderating role of father-child relationship quality and

mother-father relationship quality in the association between maternal psychological distress and child externalising behaviour.

2.1.6 Gender

Cross-sectional research from the UK has found significant gender differences in child socio-emotional behavioural outcomes which are highly correlated with the age of the child.[23;26] In addition, Bronfenbrenner's bio-ecological systems theory highlights the importance of the 'person' characteristics of the child for their development, as they impact on two-way relationships.[75] There are however, relatively few studies which have explored potential differences in the association between maternal psychological distress and child externalising behaviour by gender. Two prospective cohort studies were identified which looked specifically at the association between maternal psychological distress or depression and child externalising behaviour or conduct problems by gender.[87;88] The results were mixed, with one finding a significant association between maternal psychological distress at five years and boys' but not girls' externalising behaviour at 17 years,[87] while the other found only an association for girls but not boys at 11 years old.[88] Both studies were conducted on relatively small samples of mothers and children, with the outcome, child externalising behaviour, measured in later childhood and adolescence. There is also evidence that the timing of exposure to maternal depression may affect boys and girls differently. On the whole, evidence suggests that the association between maternal psychological distress and externalising behaviour may be stronger for boys in early childhood and stronger for girls in later childhood, although the effect on girls may be manifest in more internalising problems.[88;93;106-108] Another finding of importance to this thesis relates to the theory of gender socialisation. This theory proposes that parents respond differently to

boys' and girls' behaviour from the earliest age, dependent on whether the behaviour is deemed appropriate for that gender.[163] In addition, evidence has been found to support a differential effect of different parenting dimensions on girls and boys.[32;108;159;164-166;169;170] For example, the absence of warmth has been found to be a stronger predictor of externalising behaviour in boys, and maternal control measures have been found to increase aggression in boys but to reduce it in girls.[159;167;169] Different parenting dimensions may also have differential effects depending on the parent-child gender match, with parenting of same parent-child gender match having stronger effects.[34;175;176;190] This thesis offers the opportunity to test potential gender differences in the relationship between maternal psychological distress and externalising behaviour in the early years, as it is conducted using data from a relatively large population of approximately same-age children. This gender analysis makes up a significant contribution of this thesis.

2.2 Thesis aim, objectives and hypotheses

Having identified the gaps in the research which this thesis aims to help to fill, this section sets out the specifics of this contribution in the form of the overall aim of the thesis, the research objectives, and the hypotheses to be tested. The chapter concludes with a conceptual model (Figure 2.1) which illustrates the conceptualisation of the association between maternal psychological distress and child externalising behaviour used in this thesis and highlights the relationships and pathways to be tested.

2.2.1 Aim of the thesis

The aim of this thesis is to contribute to knowledge about the relationship between maternal psychological distress and child externalising behaviour in the early lifecourse by conducting a longitudinal analysis of contemporary data, the UK Millennium Cohort Study.

2.2.2 Thesis objectives and hypotheses

In order to achieve this aim, the following objectives and hypotheses are designed to address the gaps identified in the literature.

OBJECTIVE 1:

To examine the longitudinal association between maternal psychological distress symptoms in the early years and child externalising behaviour symptoms at five years, testing lifecourse models of sensitive periods and accumulation, the bidirectionality of the relationship, and potential differences by gender and family structure.

Hypotheses:

1a There is a direct association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years, so that as maternal psychological distress symptoms increase, so do child externalising behaviour symptoms.

1b The direct association between maternal psychological distress at nine months and three years and child externalising behaviour at five years is stronger for boys than for girls.

1c The direct association between maternal psychological distress at nine months and three years and child externalising behaviour at five years is stronger in single-mother families than in two-parent families.

1d Exposure to high maternal psychological distress at nine months only (sensitive period) is associated with a higher mean externalising behaviour score at five years in boys compared with exposure at three years only, while exposure to high maternal psychological distress at three years only (sensitive period) is associated with a higher mean externalising behaviour score at five years in girls compared with exposure at nine months only.

1e Exposure to high maternal psychological distress at both nine months and three years (accumulation) is associated with a higher mean child externalising behaviour score at five years, compared with exposure to high maternal psychological distress at either nine months only or three years only, or neither, in boys and girls.

1f There is a bidirectional association between maternal psychological distress and child externalising behaviour at three years and five years, with a stronger overall effect from mother to child than from child to mother. There is a significant gender difference in child-to-mother effects, so that this relationship is stronger for boys than for girls.

OBJECTIVE 2:

To examine the role of socio-economic position in early life (at nine months) in the association between maternal psychological distress symptoms in the early years and child externalising behaviour symptoms at five years, and to investigate potential differences by gender and family structure**.**

Hypotheses:

2a There is an inverse association between early-life socio-economic position (at nine months) and child externalising behaviour symptoms at five years, so that a lower socio-economic position is associated with higher child externalising behaviour symptoms at five years.

2b The relationship between early-life socio-economic position (at nine months) and child externalising behaviour symptoms at five years operates through its effects on maternal psychological distress at nine months and three years. There will be no significant difference by gender, and a stronger effect for single-mother families compared with two-parent families.

2c The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years is stronger within the context of disadvantage. There will be a stronger effect for boys compared with girls, and a stronger effect for single-mother families compared with two-parent families.

OBJECTIVE 3:

To investigate the role of maternal parenting, father-child relationship quality, emotional support and mother-father relationship quality in the association between maternal psychological distress symptoms in early life and child externalising behaviour symptoms at five years, examining potential differences by gender and family structure.

Hypotheses:

3a Maternal psychological distress symptoms at nine months and three years, and child externalising behaviour symptoms at five years, are associated with maternal harsh discipline, low warmth and a lower quality mother-child relationship at three years. There will be no difference by gender or family structure.

3b The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years operates through parenting behaviour at three years. There will be no difference by gender or family structure.

3c The mother-child relationship quality is the strongest parenting mediator in the association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years. There will be no difference by gender and a stronger association in single-mother families compared with two-parent families.

3d The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years is stronger in the context of low emotional support (moderator). There will be no difference by gender or family structure.

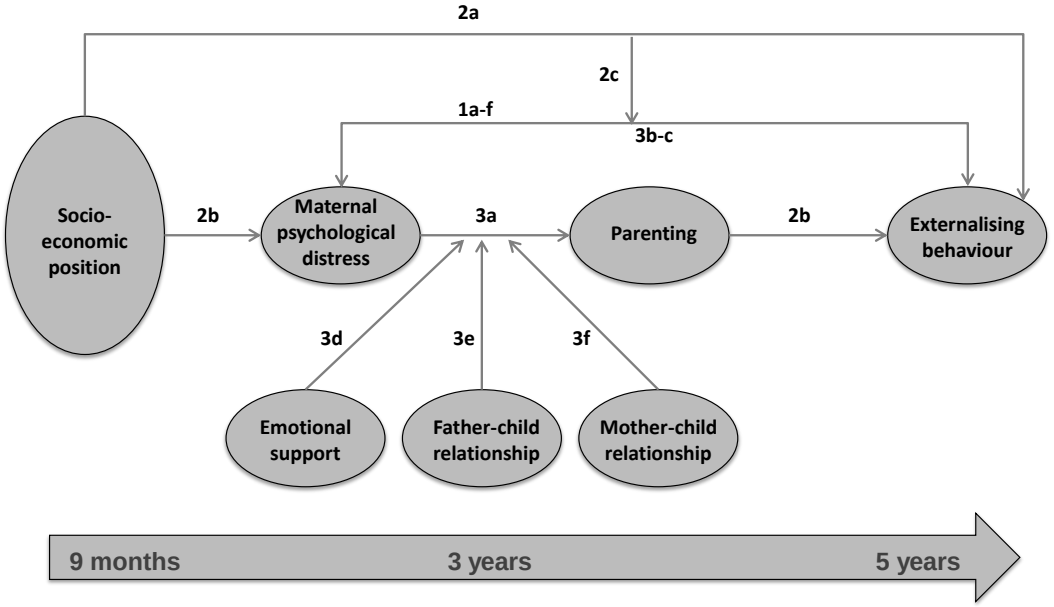
3e Among two-parent families, the relationship between maternal psychological distress symptoms in the early years and externalising behaviour symptoms in boys and girls at five years is stronger in the context of a poor father-child relationship at three years compared with families with a fair or good father-child relationship.

3f Among two-parent families, the relationship between maternal psychological distress symptoms in the early years and externalising behaviour symptoms in boys and girls at five years is stronger in the context of a poor mother-father relationship quality at three years compared with families with a fair or good mother-father relationship.

2.3 The conceptual model: the relationship between maternal psychological distress and child externalising behaviour

The conceptual model presented in Figure 2.1 illustrates the relationship between maternal psychological distress and child externalising behaviour to be tested in this thesis. The hypotheses to be tested in the thesis are indicated in the model with the corresponding number and letter.

Figure 2.1 Maternal psychological distress and child externalising behaviour: a conceptual model of relationships and pathways[4]



[4] Numbers and letters correspond to hypotheses to be tested.

Chapter 3: Methods

The methodological approach and methods used to test the research hypotheses are described in this chapter. The research design is a secondary analysis of data collected as part of the UK Millennium Cohort Study. The first section of this chapter describes the data set, the Millennium Cohort Study, including details of sampling design and recruitment. Next, the sample used in this thesis is defined. Following this, the variables identified for use in the thesis are described: the main outcome measure of child externalising behaviour, the main exposure measure of maternal psychological distress and the covariates, including mother and child characteristics, socio-economic position, parenting and its covariates, mother-father relationship quality and emotional support. In the final section of this chapter the analytical approach and methods are described.

3.1 The data: the Millennium Cohort Study

The study setting is the United Kingdom (UK) at the turn of the century. The context is the family, with traditional conceptions of the nuclear family as the 'norm' being challenged by increased rates of lone parenthood and divorce, a declining proportion of families headed by married couples, and an increased average (mean) age at first birth (27.5 years in 2008, compared with 23.8 years in 1972).[191-193]

The Millennium Cohort Study (MCS) is Britain's fourth national longitudinal cohort study, and follows the lives of a large sample of 21st-century children and their families living in the four countries that make up the United Kingdom. The MCS study population is designed to be a representative sample of UK families with at least one child born between 1 September 2000 and 11 January 2002. In England

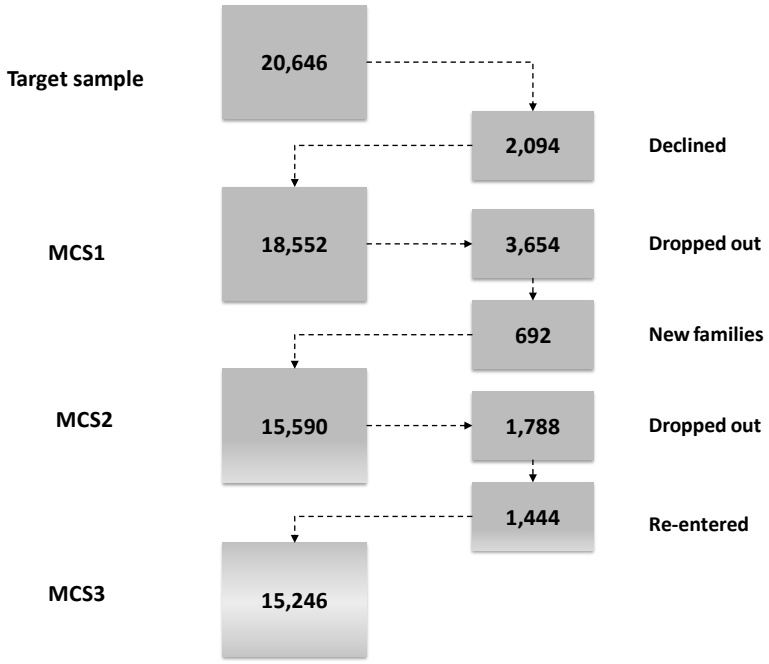
and Wales, children included were born between 1 September 2000 and 31 August 2001, and in Scotland and Northern Ireland they were born between 24 November 2000 and 11 January 2002.[194] To date there have been four data collection waves, the first when the children were around nine months old (MCS1), then at three years old (MCS2), at five years old (MCS3), and most recently at seven years old (MCS4). For the purposes of this study, only data from the first three waves of the MCS are used.

The MCS employs a complex sampling design, consisting of a stratified cluster probability sample of households identified through the Department of Work and Pensions (DWP) child benefits system.[195] Child benefit was one of the few universal benefits for families. The MCS sample is clustered geographically by UK country (England, Wales, Scotland and Northern Ireland) and stratified by electoral ward.[5] The sample was disproportionately stratified to over-represent areas of 'disadvantage' in all countries, and in England there was oversampling of areas with a high proportion of ethnic minority residents. Disadvantaged wards were drawn from the poorest 25% according to the Child Poverty Index which were not classified as 'ethnic' wards. 'Ethnic' wards were defined as those where over 30% of the population was of Black or Asian origin according to the 1991 UK census. In addition, the MCS included a boost of the sample size in Scotland, Wales and Northern Ireland. Children were sampled from all eligible children in the 398 wards identified. Eligible children were born in the UK and living in the selected wards at age nine months. Of the target sample of 20,646 families, 18,552 families (18,818 children) agreed to participate in the survey, making an overall response rate of 89% (Figure 3.1). Wave two (MCS2) was conducted in 2003, when the cohort children

[5] The UK is made up of approximately 10,661 electoral wards.[196]

were around three years old, and 15,590 families participated (15,808 children), amounting to a response rate of 78% of the 19,941[6] eligible families.

Figure 3.1 Flowchart of families in the MCS sample at waves 1, 2 and 3



Wave three (MCS3) was conducted in 2006, when the cohort children were around five years old. Out of a potentially eligible sample of 19,244[7] families, 15,246 (15,459 children) participated, making a response rate of 79.2%.[194]

[6] Followed up 18,552 families participating at wave 1, plus 1,389 families in England who appeared to have been living in sample wards at the time of MCS1 but whose addresses reached DWP records too late to be included in the first survey.

[7] Total number of families which had participated at least once.

Two sets of sampling weights were designed to enable representative analysis of any one country or of the UK whole sample. In addition non-response weights were devised after each new wave of data collection to enable adjustment of analysis for potential unit non-response bias.

Data from the Millennium Cohort Study was collected using computer-assisted personal interviewing (CAPI) and computer-assisted self-interviewing.[197] The CAPI questionnaire is divided into modules of questions according to topic. Interviews were conducted in participant families' homes, with both mothers and fathers, or father figures, where resident.[198]

3.2. Identifying the study sample

The selection of the study sample was informed by the thesis aim, objectives and hypotheses, which aim to investigate the longitudinal relationship between maternal psychological distress and child externalising behaviour throughout early childhood. For the longitudinal analysis, data was required for each family at all three of the first three waves of the MCS. The study sample was thus restricted to MCS families who participated in all three waves of the MCS (n=13,054). As the main focus of the study is on the relationship between mother and child, it was decided to restrict the sample further to families where the biological or birth mother was present and also acted as the 'main respondent' at all three MCS waves. This was to ensure that, in the study sample, data from the first three waves of the MCS were completed by the same person, the birth mother, and hence were comparable across the waves. Adoptive mothers were excluded from the study sample, as research suggests genetic influences may be important in behaviour research.[199] Lastly, the study sample was restricted to families with a singleton cohort child (n=12,603), as

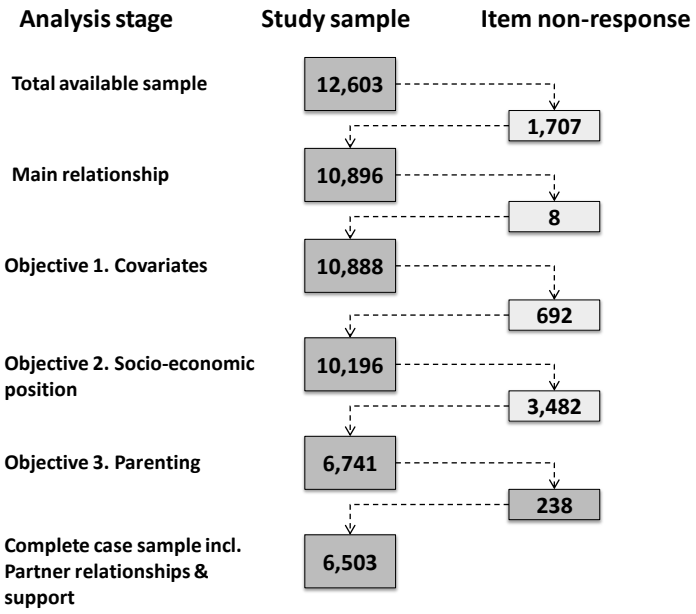
including children from multiple births may have skewed the results as these children have a higher risk of behavioural problems as a result of poorer birth outcomes, differences in parenting and the effects of parent-child interactions.[200]

3.3 Approach to item non-response

The approach taken to item non-response in the thesis is complete-case analysis, which is commonly used in epidemiological longitudinal studies.[201] Using only 'cases' which have complete data available for all of the variables used in the study means that results are internally consistent and comparable. Figure 3.2 illustrates the item non-response at each stage of the analysis, beginning with the total available sample (n=12,603) and ending with the complete-case study sample (n=6,503). As groups of variables were identified for use in the thesis analyses to meet each of the three study objectives, the sample reduced according to the number of participants with incomplete data for the identified variables. At the first stage of the analysis, to test the main relationship between maternal psychological distress and child externalising behaviour, missing cases reduced the sample by 1,707 participants. Of these, missing data on child externalising behaviour at nine months and three years accounted for 526 excluded participants, while missing data on maternal psychological distress at nine months, three years and five years accounted for 1,181 excluded participants. The largest proportion of missing data on maternal psychological distress (820) occurred at three years. The child and mother covariates of family structure at nine months and three years, mothers' age at birth, child's birthweight, gender, age at MCS third wave and birth order accounted for only eight additional missing cases. The next stage of the analysis included the socio-economic position measures of equivalised family income and 60%-below-median income, self-rated financial status, maternal education, housing tenure and

overcrowding. Of the 692 participants with missing socio-economic data, the large majority (689) had missing data for family income. For analyses associated with study objective three, the parenting variables accounted for a reduction in the sample of 3,482 participants. Of these, parental warmth accounted for the loss of 891 participants, the parent-child relationship accounted for 568 participants, the conflict tactics scale items for 724, and post-natal attachment score for 815 participants. Child temperament accounted for the exclusion of 453 participants as follows: mood 113, adaptability 188 and regularity 152.

Figure 3.2 Complete-case sample by stage of analysis



Finally, the partner relationship and emotional support variables at nine months and three years accounted for the loss of a further 238 participants, making a final study

sample of n=6,503. The largest available sample at each stage of the analysis was used for the sensitivity analysis. The complete-case study amounted to 52% of the available study sample. This is the sample used in all of the analyses presented in this thesis unless otherwise stated, and is referred to as the study sample. A further study subsample was derived for the analysis including fathers. This was made up of the complete-case sample restricted to families with a father at each of the first three MCS waves and with complete data for the father-child relationship score variable (n=3,846).

Using a complete-case sample inevitably results in a smaller available sample in addition to the possibility that the sample might no longer be representative of the original population. For example, respondents who do not complete certain questions, such as on family income, may be more likely to have a very high or very low income and therefore deplete the sample of participants from those categories.[202] To help determine the robustness of the findings in the study sample, sensitivity analyses were conducted at each key stage of the analysis. Sensitivity analysis requires that results be examined to see how they are affected by changes to the methods or measures to see whether findings remain stable.[203] For the purposes of this study, sensitivity analyses are conducted by repeating the analysis using the largest possible sample at each stage of the analysis, with the exception of the final stage, when a larger sample was not available. At the final stage of the analysis, changes to measures were used for sensitivity analyses purposes.

3.4 Variables used in the thesis

As a general rule, for all of the variables and for the purpose of the analysis variables, the options 'refused', 'don't know' and 'not applicable' were recoded as missing.

3.4.1 Outcome variable: child externalising behaviour

Child externalising behaviour score at age five is the main outcome of the study. In the MCS this is measured using the Strengths and Difficulties Questionnaire (SDQ)[204] collected as part of the MCS computer-assisted personal interview (CAPI). The SDQ was designed as a child behavioural screening questionnaire for three-to-16-year-olds, and has been extensively validated in clinic and community samples.[205-207] As a screening tool for mental disorder the SDQ shows good sensitivity and specificity, being able to distinguish between psychiatric and other service clinic attendees in Receiver Operated Characteristic (ROC) curves. The area under the curve for parent reports is .87 (95% CI .83–.91).[204] In a community sample of British children aged five to 15 years, the SDQ detected around two thirds of children with a mental disorder, although the screening efficacy varied by type of disorder.[206] The SDQ was particularly efficient at identifying conduct disorder, hyperactivity, depression, pervasive developmental disorders and anxiety, with a sensitivity of 70% to 90%.

In the MCS, the SDQ was completed at age three (MCS2) and age five (MCS3) by the 'main respondent', who in the study sample is the biological or birth mother. The SDQ measure consists of 25 statements about aspects of child behaviour, both positive and negative, and indicative of 'strengths' and 'difficulties'. The 25 items are subdivided into five distinct dimensions of child behaviour: emotional symptoms (five

items), conduct problems (five items), hyperactivity/inattention (five items), peer relationship problems (five items) and prosocial behaviour (five items) (see Appendix 3.1). For each item, response options are 'not true', 'somewhat true' or 'certainly true', which are scored 0, 1 and 2 respectively. The five subscales can each be summarised into a dimensional score ranging from 0 to 10, or else summed as a total 'difficulties' score ranging from 0 to 40, excluding the prosocial score.[204] The externalising behaviour score used in this thesis combines the conduct problems and hyperactivity subscales into one score ranging from 0 to 20.[25]

Recent research has compared the use of the five dimensions of the SDQ and the broader 'externalising' and 'internalising' behaviour scales in a low-risk community sample.[184] The researchers concluded that in a low-risk community sample, particularly of younger children, the use of the broader externalising behaviour scale was a more cautious approach to measuring child mental health than the use of the five dimensions of the SDQ. Studies of the psychometric properties of the SDQ internalising scale (emotional symptoms) and externalising scale (conduct problems and hyperactivity) have reported a clear delineation between the two scales, which measure two separate constructs, in particular for the parent-reported SDQs.[207] This is in contrast with other commonly used child behavioural screening tools – for example, the Child Behaviour Checklist,[208] where higher correlations of these broader scales are reported.

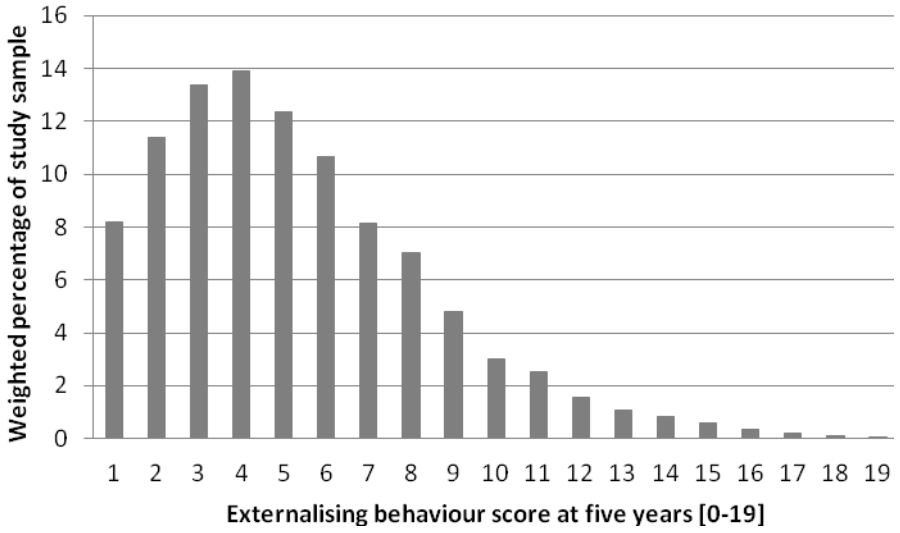
The SDQ was originally designed as a screening tool to identify children at risk of mental disorder. In this case the individual dimension scores and total difficulties score can be derived into a case/no case measure using standardised cut points. More recently the SDQ has been evaluated for its potential as a continuous dimensional measure of child mental health. The dimensionality of the total

difficulties score (externalising and internalising scores combined) was evaluated in a UK population of children, and results showed that the odds of a disorder increased at a constant rate across the range of the score, with no evidence of threshold effects either cross-sectionally or longitudinally.[184] In addition, the use of the SDQ as a case/no case measure in community samples is now thought to require a much higher threshold than previously recommended to represent the clinical range – between the top 2 to 5% of children and not the originally suggested top 10%.[209] In this thesis the externalising behaviour score is used as a continuous measure.

Preliminary descriptive analysis was conducted on the main outcome measure, child externalising behaviour score at age five, to ascertain its distribution in the study sample. This is important, as the study uses the score as a continuous measure, and a number of statistical tests are based on the assumption of a normal distribution. Figure 3.3 shows the distribution of the child externalising behaviour score in the MCS children at five years, and it can be seen that the distribution does not appear normal, in which case a bell-shaped symmetrical curve would be seen. Statistics of skewness and kurtosis showed that the externalising behaviour score was positively skewed, having a statistic of 0.90 (with 0 for no skewness). In relation to kurtosis, which is a summary of the shape of the peak and tail of the distribution, with 3 being a normal distribution, the statistic was 3.6 for the distribution of child externalising behaviour at five years. The summary statistics and histogram show that the child externalising behaviour score does not meet the criteria for a normal distribution, although it is not severely non-normal either. One approach used to deal with non-normal distribution is to transform the data so as to adjust it to a more normal distribution. This approach was explored for the child externalising behaviour score, and no improved distribution was found (see Appendix 3.2). A transformation

of the natural log was also explored, and again this did not improve the distribution. A review of the literature found several studies which had used linear regression with non-normally distributed outcome data,[210-212] including the externalising behaviour score,[47;213] with the proviso that the sample size was large enough.

Figure 3.3 Distribution of externalising behaviour score in the study sample at five years



Support for the use of the child externalising behaviour score as a dimensional score in linear regression modelling, even though not normally distributed, was provided in personal communication by Goodman, who developed the SDQ.[209] Lumley and colleagues demonstrated that the comparison of the mean of the variable for each study subject, which is the premise of linear regression, is valid in even very small samples if the outcome is normally distributed, whereas in large samples it is valid for any distribution. Their analysis of extremely positively skewed data showed that in sufficiently large samples (n≥500), linear regression depended only on the assumption of variance of errors (homoscedasticity), and not on the

normal distribution of the data.[215] Other assumptions of linear regression include the independence of the error terms and the normal distribution of residuals.[216] Although the use of the broader externalising scale is more appropriate for use in low-risk epidemiological samples, some researchers have chosen not to use these bands because of a lack of normative data.[217] However, for the purposes of this study the decision was made to use the broad scale of externalising behaviour as a continuous measure, as the sample size was far in excess of the recommended 500,[215] and therefore the results would be reliable as long as the post-regression assumptions were met.

3.4.2 Main explanatory variable: maternal psychological distress

The main explanatory variable or exposure for the study is maternal psychological distress measured at nine months (MCS1) and three years (MCS2). At MCS1 maternal psychological distress was measured using a modified version of the Rutter Malaise Inventory (nine selected items).[218;219] At MCS2 the measure of maternal psychological distress changed to the Kessler Six-item Psychological Distress Scale (K6) and remained the same for MCS3.[220]

The Rutter Malaise Inventory is made up of a set of 24 questions to measure levels of psychological distress or depression.[219;221] The Inventory has been used extensively across population samples, and has been assessed as having good correlation of scores over two-year testing occasions, as well as internal reliability.[222] In its original 24-item form, the measure has been found to identify two distinct factors, broadly defined as psychological and physical malaise.[53;223-226] At the first wave of the MCS, nine items from the original 24 were selected to measure psychological distress.[218] Details of the construction of the nine-item version of the Malaise Inventory are given in Appendix 3.3. At MCS1 main respondents answered

the nine Malaise Inventory questions as part of the self-completion CAPI questionnaire (Box 3.1).[197;219] Respondents could answer yes or no, scored 1 and 0 respectively, to each item.

Box 3.1 Shortened Malaise Inventory (nine-item) questions

The next questions are about how you are feeling generally.

1. Do you feel tired most of the time?
2. Do you often feel miserable or depressed?
3. Do you often get worried about things?
4. Do you often get into a violent rage?
5. Do you often suddenly become scared for no good reason?
6. Are you easily upset or irritated?
7. Are you constantly keyed up and jittery?
8. Does every little thing get on your nerves and wear you out?
9. Does your heart often race like mad?

A total score is then derived, ranging from 0 to 9. Studies have used this score, dichotomised at a cut point of four and above, to indicate an increased probability of depression or anxiety.[218;227-229] The score has also been used as a continuous measure of psychological distress,[230-232] and this is the case in this study. A dichotomous variable of maternal psychological distress at nine months was also derived, using the top 10% of mothers' scores as a cut point. In this sample the top 10% represented a cut point of 4 and above. The dichotomous variable was used to derive a longitudinal measure of high maternal psychological distress, described later.

The Kessler Six (K6) replaced the nine-item Malaise Inventory as the measure of current psychological distress from MCS2 onwards.[233;234] A pilot study was conducted to compare the Malaise nine-item scale and the K6 scales. The study concluded that the shortened Malaise Inventory showed very similar psychometric properties to the K6,[235] and the change of measure went ahead. Details of this comparative work can be found in Appendix 3.4. The K6 is a short screening tool designed to assess non-specific psychological distress in community samples.[220] It has shown consistent psychometric properties across major subsamples of community populations, discriminates strongly between cases and non-cases, and is an effective screening tool for recent or current depression in community samples.[63;236-238] As part of the MCS2 self-completion questionnaire, the 'main respondent' was asked the K6 questions (Box 3.2).

Box 3.2 Kessler Six-item Psychological Distress Scale questions

During the past four weeks (28 days), how much of the time did you feel….

1. So sad nothing could cheer you up?
2. Nervous?
3. Restless or fidgety?
4. Hopeless?
5. That everything was an effort?
6. Worthless?

Response options were ‘all of the time’, ‘most of the time’, ‘some of the time’, ‘a little of the time’, ‘none of the time’ or ‘can’t say’, scored from 0 to 4 or as missing. The six items can then be summed to produce a total K6 score ranging from 0 to 24. The total score can be used in a number of ways, such as categorised into three or four groups,[143;239] dichotomising at 7 and above to indicate psychological distress,[240;241] at 13 and above to indicate ‘serious psychological distress’,[242;243] or as a continuous measure.[244;245] For the purposes of this study the score was used mainly as a continuous measure.

A dichotomous measure was derived using the top 10% of mothers’ scores as the cut point for the K6, in keeping with the process used for the MCS1 Malaise Inventory, for consistency and comparison between them. The K6 respondents with a score of 9 or higher were categorised as having ‘high’ psychological distress and those with a score of less than 9 as ‘low’ psychological distress.

A longitudinal measure of high maternal psychological distress was derived, combining the dichotomised Malaise Inventory score (MCS1) and K6 scores (MCS2). The longitudinal measure consisted of four categories for the frequency of high maternal psychological distress at MCS wave 1 and 2: ‘neither wave 1 nor 2’, ‘wave 1 only’, ‘wave 2 only’ and ‘both wave 1 and wave 2’. An alternative approach was considered to develop a cumulative score whereby the two continuous psychological distress scores at wave 1 and wave 2 would be combined to create a total score across the two waves. However, this idea was rejected, as the wave 1 and wave 2 measures of psychological distress differed, and it was deemed inappropriate to combine them in this way.

3.4.3 Covariates in the main relationship

Potential covariates of importance in the main relationship between maternal psychological distress and child externalising behaviour were identified a priori during the early literature review. These covariates were: family structure at nine months and three years, mother's age at birth of cohort child, child's birthweight, gender, age of child at MCS3 (when the outcome was measured), and birth order.

Family structure

For the purposes of the study the sample is stratified by family structure in order to test some of the hypotheses. Family structure is of importance in this study for a number of reasons, not least because poorer child socio-emotional behaviour outcomes have been found among single-parent families and this is often attributed to increased socio-economic disadvantage.[133;141;142] A family structure variable was available in the MCS dataset, dichotomised into two-parent and one-parent families. Family structure was measured at both nine months and three years, and both measures are used in the study.

Mother's age at child's birth

Maternal age at the cohort child's birth is an important covariate, and is known to effect child outcomes via a number of complex pathways. For example, younger age at motherhood is associated with poorer reproductive outcomes,[246] lower educational status and lone parenthood,[247] which in turn are associated with poorer child cognitive and behavioural outcomes. In addition, older age at motherhood is also associated with poorer reproductive outcomes,[248] which may impact on later child outcomes. The variable of mother's age in years was used as a continuous measure for the purposes of the thesis analyses. To adjust for a possible non-linear

effect of age, an age-squared variable was derived and used together with mother's age in the regression analysis. For descriptive purposes the age in years measure was categorised as follows: 13–19, 20–24, 25–29, 30–34, and 35 years and older.

Child's birthweight

Low birthweight is commonly proposed as an indicator of maternal health during pregnancy, as well as being an important predictor of newborn health and development.[249] Low birthweight has been found to predict later psychopathology, and is an important risk factor for child socio-emotional behavioural development.[250;251] At MCS1, birthweight was recorded in kilograms by checking the mother's maternity record (red book). The WHO definition of low birthweight was used to derive a binary measure of birthweight, with children born at less than 2.5kg categorised as low birthweight.

Gender of child

Gender differences in child socio-emotional and behavioural development are strongly indicated in the literature and therefore make up an important variable in this study. The cohort child's gender was recorded at MCS1 as male or female and used as a binary variable in the study.

Child's age at MCS3

Child's age is an important determinant of development and behaviour. For the purposes of the study the child's age at MCS3 was used in the analysis, as this was the time point when the externalising behaviour outcome was measured.[143] Child's

age group in months is used for the descriptive analysis, and child's age in days is used in the tests of association and as a covariate in the regression analyses.

Birth order

The measure of birth order was derived from a continuous variable of number of children in the household at the cohort child's birth (excluding the cohort child). The continuous variable was grouped into the categories 'first', 'second', 'third' and 'fourth or later'. Birth order is frequently used as a standard control variable in studies of child health, and aims to capture aspects of the child's initial endowment of health.[252] It has also been found to be associated with externalising behaviour.[253]

3.4.4 Measuring socio-economic position

The FSM pathway forms a key theoretical justification for exploring the role of family economic hardship and economic pressure in the relationship between maternal psychological distress and child externalising behaviour in this thesis.[119] Conger and colleagues suggest that low income is a useful marker of socio-economic hardship and operates through economic pressures such as unmet material needs and the inability to pay bills. It is the experience of these pressures and strains that is thought to give rise to psychological distress in the parents, which can result in poorer parenting and subsequent worse child outcomes.[119-121] For the purposes of this study, family income is used as a measure of economic hardship, while self-rated financial status is used as a measure of economic pressure. Maternal education, although correlated with income, may operate via different pathways to influence child behavioural outcomes, such as parenting[254] and partner relationships.[127] Further to these, two additional socio-economic position measures

are included in the thesis: housing tenure and overcrowding. Both have been found to be independently associated with child outcomes, perhaps as proxies of the child's environment, which can mediate the effects of income and education.[255] In addition, as the study does not include ethnicity specifically, the economic measures of housing tenure and overcrowding have been proposed as important when accounting for ethnic differences in socio-economic position in the UK.[256]

Household income and poverty

For the purposes of this study equivalised household income at nine months (MCS1) is used.[257] The scale used was originally developed by McClements at the Department of Health and Social Security explicitly to take into account the influence of the number and the ages of children on the living standards of the household. Unlike the OECD scales, the McClements scale equivalises the household income to the reference unit of an adult couple. The McClements scale has traditionally been favoured by researchers in the UK, as it has allowed comparability with results from government research.

Details on income were collected at MCS1 as part of the CAPI questionnaire. Main respondents were shown a card of weekly, monthly and annual income groups and were asked which group represented their total household income, including benefits and after tax and deductions. The McClements scale was developed from these categories, and is a best estimate of household income. The McClements scale can be used in a number of ways, depending on the research question; for example, as a continuous measure, or grouped into income quintiles, tertiles or binary groups to indicate those above and below a poverty threshold.[143;258;259] Income quintiles are used in the thesis for descriptive purposes, and income tertiles

are used in the analyses stratified by family structure. Income tertiles are labelled as 'low' 'middle' and 'high' income. The binary McClements scale available in the MCS dataset of 60% below median income is used as a measure of poverty.

Self-rated financial status

Self-rated financial status is used in this study as a marker of socio-economic pressure. As part of the CAPI questionnaire respondents were asked, 'how well would you say you (and your partner) are managing financially these days?'[260] Response options were 'living comfortably', 'doing alright', 'just about getting by', 'finding it quite difficult', and 'finding it very difficult'. The aim of this measure was to distinguish between families experiencing economic pressure and those who were not. During preliminary analyses using the complete-case sample, two of the financial status categories ('finding it quite difficult' and 'finding it very difficult' to manage), were found to have very small response numbers; these categories were therefore combined with the category 'just about getting by' to indicate economic pressure.

Maternal education

Main respondents completed questions at MCS1 about their highest academic and vocational qualifications, which were combined to form the derived variable 'highest educational attainment level'. This variable is made up of the categories 'NVQ level 1', 'NVQ level 2', 'NVQ level 3', 'NVQ level 4', 'NVQ level 5', 'other/overseas' and 'none of these'. NVQ levels 1–5 were reverse coded for the purposes of the thesis so that the highest qualification was the reference group. For descriptive analysis, all of the education categories were reported. For the purpose of the regression

analysis, NVQ levels 3, 4 and 5 were combined, as they had very small cell sizes. Together they form the equivalent of having two or more A levels, a degree/higher degree or university education, which fitted together conceptually.[261] NVQ level 2 is equivalent to five or more grade A–C O levels/GCSEs, while NVQ level 1 is equivalent to fewer than five C-grade or below O level/GCSE qualifications. The education categories of 'none' and 'other/overseas' qualifications had very few respondents, but were retained as distinct groups because they could not easily be conceptually combined with each other or another category.

Housing tenure

The housing tenure measure available in the MCS1 consisted of 10 categories of housing, plus 'refusal', 'don't know' and 'not applicable'. The 10 categories were collapsed into five categories: 'owner-occupier', 'private rental', 'local authority/association rental', 'parents/rent-free' and 'other'. Owner-occupier included 'own outright', 'own with mortgage/loan' and 'part rent/part mortgage (shared equity)'. Private rental remained the same, while 'local authority/association rental' was collapsed from 'rent from housing association' and 'rent from local authority'. 'Parents/rent-free' was collapsed from 'living with parents' and 'live rent-free'. Lastly, the 'other' category included 'squatting and other'. For the stratified analyses the categories were further collapsed into three groups – 'owner/private rental', 'local authority/social rental' and 'parents/rent-free/other' – because of the small cell sizes in some categories.

Overcrowding

Overcrowding has been found to be an important component of the contextual risk environment affecting parenting and consequently impacting on child behaviour.[262]

For the purposes of the study, an overcrowding variable was derived according to the Office of National Statistics' definition of less than one room per person.[263] The overcrowding variable was derived by dividing the total number of people in the household by the number of rooms, excluding the bathroom and kitchen if separate. The resultant variable was dichotomised into '1 or more rooms per person' and 'less than 1 room per person' to denote overcrowded living conditions.

3.4.5 Measuring parenting and additional covariates

For the purposes of the study, and in line with the FSM, parenting was hypothesised as a mediator in the relationship between maternal psychological distress and child externalising behaviour. A review of the literature highlighted parental hostility and harshness, a lack of warmth and the parent-child relationship as particularly important in the context of child externalising behaviour. Four measures of parenting collected as part of the MCS2 were identified as most relevant to the study. These were parental warmth and parental lack of hostility, measured as part of the Early Childhood Home Observation for Measurement of the Environment Inventory (EC-HOME); the parent-child relationship, measured using the Pianta scale; and disciplinary practices, measured using two items from the Conflict Tactics Scale (CTS).[70;264] MCS2 was the only wave at which the parent-child relationship was measured. Two additional a priori-identified covariates controlled for at this stage of the analysis were child temperament and post-natal attachment at nine months.

EC-HOME: maternal warmth and lack of hostility

The EC-HOME is one of the most widely used assessments of a young child's home environment, and numerous studies have reported associations between children's

EC-HOME scores and various development outcomes, including behaviour problems.[265-267] It was originally developed as a single inventory comprising 55 items gathered through maternal report and interviewer observation. Five subscales were subsequently identified as having good psychometric properties, including 'parental warmth', 'parental lack of hostility', 'learning stimulation', 'access to reading' and 'interior of home'.[268] Two of these subscales were identified as important for the thesis, 'maternal warmth' (five items) and 'maternal lack of hostility' (three items), with 'learning stimulation', 'access to reading' and 'home interior' excluded. The EC-HOME Inventory was completed as part of the MCS2 'child assessment' by interviewer observation.

The measure of maternal warmth was made up of five items reported by the interviewer: 'mother's voice positive when speaking to child'; 'mother converses at least twice with child'; 'mother answers child's questions verbally'; 'mother praises child spontaneously'; and 'mother caresses or kisses child.' The yes/no (1/0) responses were then summed to create a total score of 0 to 5. This score was dichotomised into two categories, with 0 to 2 indicating 'no maternal warmth' and 3 to 5 indicating 'maternal warmth'.

The EC-HOME measure of lack of hostility was made up of three items scored yes/no (1/0): 'mother scolded child more than once'; 'mother used physical restraint on child'; and 'mother slapped or spanked child.' In this case a 'no' to all three items was categorised as 'no hostility', while a 'yes' to one or more items was categorised as evidence of 'hostility'.

Mother-child and father-child relationship quality

In the MCS2 the parent-child relationship quality was measured using questions from the 'Parent-Child Relationship Scale' (Pianta), and was completed by the mother and father (when present).[269] The measure consists of 15 items (see Appendix 3.5), with each item rated on a five-point Likert scale: 'definitely does not apply', 'does not really apply', 'neutral', 'applies sometimes' and 'definitely applies', scored from 1 to 5 respectively.[270] The scale is designed to assess positive aspects of the child-parent relationship such as parental perception of openness (seven items), and negative aspects of the relationship such as conflict (eight items). Some of the Pianta questions were adapted to the age of the child for the MCS questionnaire.[271] The Pianta can be used as two separate scores, one measuring the positive aspects of the relationship and one the negative aspects,[143] or as a single scale with one end of the scale representing a high positive/low negative relationship and the other vice versa.[136] For the purposes of the thesis a single scale is used, as evidence of the parent-child relationship suggests that it is the combination of a lack of positivity and increased conflict which is associated with the poorest child outcomes. In addition, preliminary analysis showed the single scale to have a superior internal consistency to the two separate scales (Cronbach alpha=0.77).

Positive statements were recoded so that a low score corresponded to a closer, more positive relationship. The negative statements already had a low score corresponding to a less negative relationship, so they were unchanged. The 15 variables were then summed to create a total Pianta score ranging from 15 to 60, with a low score indicating a more positive and less negative relationship. The father-child relationship quality score was categorised into tertiles for the purpose of

testing for effect modification. The tertiles were nominally labelled ‘good’, ‘fair’ and ‘poor’.

Harsh discipline

The Conflict Tactics Scales Parent-Child (CTSPC) is a 35-item measure of psychological and physical maltreatment of children by parents and non-violent modes of discipline.[272] The MCS2 included seven items drawn from the CTSPC assessing the frequency of the following discipline practices: ignore, smack, shout at, give time out, withdraw treats, tell off and bribe the child.[272] For each item mothers were asked how often they used these discipline approaches with the cohort child, to which they could respond ‘never’, ‘rarely’, ‘once a month’, ‘once a week or more’ or ‘daily’, scored from 1 for ‘never’ to 5 for ‘daily’. Each item can be used separately, or if all seven items are used a total score can be derived by summing the seven items to create a score ranging from 7 to 35, with a lower score indicating a lower frequency of discipline. Two items were identified for use in the study which most clearly measured harsh discipline: ‘smack’ and ‘shout at child’. These were used as single items.

Child temperament

In young children it is thought likely that the combination of a difficult temperament and a non-optimal environment plays a role in the development of child behavioural difficulties.[92] Child temperament was measured in MCS1 as part of the self-completion questionnaire using a subset of 17 questions from the Revised Carey Infant Temperament Questionnaire.[91;273;274] Of the 17 items, 14 aimed to measure three dimensions of temperament: baby’s mood (five items), adaptability (five items) and regularity (four items).[275] The three remaining items measured a baby’s

tendency to cry and could not be linked to a dimension of the Carey Temperament Scale, so were excluded.

Each item incorporated a statement about the baby's behaviour, followed by a five-option answer ranging from 'almost never' to 'almost always'. Total scores for each dimension were derived by summing the item scores for each domain of child temperament. For the mood dimension, one item which asked how the child reacted to injury was excluded, as a large proportion of mothers answered 'can't say'. Similarly, for the adaptability dimension, two items, baby's reaction when bathing in a different place than usual and baby sleeping in a different location, were excluded because a large proportion of mothers answered 'can't say'. The total scores for the three dimensions of temperament were mood 4–20, adaptability 3–15 and regularity 4–20, with a low score representing a more 'difficult' baby.

Post-natal attachment

Post-natal attachment is associated with the later parent-child relationship, and this may be influenced by maternal psychological distress. To assess mother-to-infant attachment in the MCS at nine months, six items out of the original 19-item self-report Condon Maternal Attachment Questionnaire were available.[276] The six items were 'feelings of annoyance or irritation', 'think about the baby when apart', 'feelings when leaving the baby', 'feelings when caring for baby', 'feelings of patience when with baby' and 'feelings about giving up things due to baby'. Response option categories varied for each statement, but all were scored on a four-point Likert scale with a weak attachment response coded 1 and a strong attachment response coded 4. For the purposes of the study each item was recoded 0 to 3, and a total score variable was derived by summing the six scores to create a measure ranging from 0

to 18, with 0 indicating a weak maternal attachment and 18 a strong maternal attachment.

3.4.6 Measuring mother-father relationship quality and emotional support

The final section of the analysis explores the moderating role of mother-father relationship quality and emotional support concurrent with maternal psychological distress in the association between maternal psychological distress and child externalising behaviour.

Mother-father relationship quality

Mother-father relationship quality was measured at MCS1 and MCS2 using a shortened version of the 28-item Golombok Rust Inventory of Marital State (GRIMS), which measures closeness, communication and satisfaction with one's partner.[277] Lone parents responded to these items as 'not applicable', as did a small number of two-parent respondents. The shortened version of the GRIMS used at MCS1 consisted of seven items: 'partner is sensitive and aware of your needs'; 'partner doesn't listen'; 'sometimes feel lonely when with partner'; 'relationship full of joy and excitement'; 'wishes there was more warmth and affection'; 'suspects on brink of separation'; and 'can make up quickly after argument'. Response options were on a five-point Likert scale, and for positive statements were scored 1 'strongly agree, 2 'agree', 3 'neither agree or disagree', 4 'disagree' and 5 'strongly disagree', and reverse coded for negative statements. At MCS2 only four of the seven GRIMS items were used to measure partner relationship quality: 'partner is sensitive and aware of your needs'; 'partner doesn't listen'; 'sometimes feel lonely when with partner'; and 'suspects on brink of separation'.

For continuity of the measures across MCS1 and MCS2, only the four items used at wave 2 were selected for use at wave 1. Response options were recoded 0 to 4 for each item, and then a summary score was generated ranging from 0 to 16 for MCS1 and MCS2 partner relationship quality. A low score indicated a more positive relationship and high score a more negative relationship. The mother-father relationship quality measure was categorised into tertiles for the purpose of testing for effect modification. The tertiles were nominally labelled 'good', 'fair' and 'poor'.

Emotional support measure

At MCS1 and MCS2 main respondents were asked how they felt about the following statement: 'I have nobody to share my feelings with.' Response options were on a five-point Likert Scale, ranging from 1 'strongly disagree' to 5 'strongly agree'. For the purposes of the study the measure was used in its original form, except that responses 4 and 5 were combined to create the category 'agree/strongly agree' because of the small cell size in these categories.

3.5 Data analyses

3.5.1 Testing associations

Testing for associations between variables is of importance in epidemiological research, as statistically significant associations may indicate causality and identify important risk and confounding factors. The primary approach used in this study was to identify potentially important covariates and confounding variables a priori from the literature review and theory.[278] Those variables which were available in the MCS

data set were then tested for their statistical association with the study outcome and exposure in the study population.

The type of statistical association test varied, depending on the measurement scale of the study variable. The premise on which the statistical tests of associations were identified was one of caution. Non-parametric tests were used, as they did not require an assumption of normality of distribution in tests for associations with continuous variables. For the association between maternal psychological distress score and child externalising behaviour score, the Spearman rank-order correlation coefficient rho (r_s) was used. This is essentially a Pearson *r* simplified to enable a lower-order scaling, in this case non-normal distribution, of the continuous scores. This test was also used when testing the association of the ordinal categorical variables with the exposure or outcome score measures. The Kruskal-Wallis equality-of-populations rank test was used to test the association of the nominal categorical variables with the continuous exposure or outcome scores. Finally, the two-sample Wilcoxon rank-sum (Mann-Whitney) test was used to test the association between the nominal binary measures and the outcome or exposure score. Statistical significance was set at 1%, with a test p-value of 0.01 or below denoted as statistically significant and indicative of an association.

3.5.2 Multiple regression analyses

Regression modelling can be used to explore the relationship between an exposure and an outcome while controlling for the effects of potential confounding variables on the relationship. Linear regression is used when the outcome to be predicted is a continuous measure, as in this thesis. The regression line represents the best estimate of the predicted scores given a corresponding exposure value. Multiple

linear regression refers to regression models with more than one predictor variable. As with other inferential statistics, a regression coefficient is an estimated sample value of a true population value, and it is therefore necessary to predict the magnitude of the error. In this case the standard error (SE) is used, which measures the average deviation from the mean. A wide SE range results in lower confidence in the predicted value, and a narrower SE range a higher confidence in the prediction. The error terms can be plotted to test the assumption of normality; this is important in this thesis, because the outcome variable is not normally distributed. If the error terms are normally distributed we can have confidence in the regression estimates. Additional post-regression tests were conducted, which are mentioned later.

The multiple regression analyses strategy was informed by the three theories described in the literature review: Bronfenbrenner's bio-ecological model, lifecourse theory, and the family stress model.[73;97;116;279] Epidemiologists have criticised a purely statistically driven approach to modelling, and advocate theoretically driven analysis to promote the meaningful interpretation of results.[280] For example, the apparent effects of a more conceptually distal variable on child externalising behaviour, such as income, may disappear after controlling for a more proximal factor, such as maternal psychological distress. Statistically the interpretation may be that income has no effect on child externalising behaviour after adjusting for other variables in the model. Using Bronfenbrenner's notion of conceptually nested levels of the environment and the FSM pathway, another interpretation would be that the effect of income operates through maternal psychological distress, or other covariates, to influence child externalising behaviour. The connotations of the different interpretations are clear when we consider how these might impact on the policy and research agenda. For the former the focus would be on the mother's

mental health, and for the latter on economic hardship as a driver of poor maternal mental health and consequent child outcomes.

The conceptually nested regression analysis approach is illustrated in Figure 3.4, with each objective illustrating a stage in the multiple regression analysis. The focus variables are highlighted in bold, and the covariates are in normal font. In addition, the element of time is illustrated, which allows the testing of lifecourse models as well as of the direction of associations. At each stage of the regression modelling all of the variables identified for use at that stage of the analysis were added to the model. Post-regression estimation tests for homoscedasticity, independence of the error terms, normality of residuals and multicollinearity were conducted.[216]

Figure 3.4 Variables used at each stage of the multiple regression analysis

MCS1 9 months	MCS2 3 years	MCS3 5 years
Objective 1: Maternal psychological distress and child externalising behaviour		
Maternal psychological distress **Covariates:** Family structure Mother's age at birth Child's birthweight Gender Birth order	**Maternal psychological distress** **Child externalising behaviour*** Family structure	**Child externalising behaviour** **Maternal psychological distress*** Child's age at interview
Objective 2: The influence of early socio-economic position		
Family income **Below-60%-mean poverty** **Self-rated financial status** **Maternal education** **Housing tenure** **Overcrowding**		
Objective 3: The role of parenting, partner relationship quality and emotional support		
Emotional support **Partner relationship** **Covariates:** Child temperament Post-natal attachment	**Emotional support** **Partner relationship** **Parental warmth** **Parental hostility** **Parent-child relationship** **Conflict Tactics Scale items**	

*Additional measure to control for continuity effects in bidirectional relationship.

3.5.3 Testing for effect modification

Effect modification occurs when the effect variable depends on the level of another factor and the effect is significantly different across levels of this other factor.[203;281] This is also known as a statistical interaction, and the two terms can be used interchangeably. In the thesis, effect-modifiers were hypothesised a priori from the literature. An example of a hypothesised effect-modifier in the relationship between maternal psychological distress and child externalising behaviour is the gender of the child. In this example, the relationship between maternal psychological distress and child externalising behaviour is proposed to operate differently for boys compared with girls. Potential effect-modifiers in the relationship between maternal psychological distress and child externalising behaviour were tested by adding a two-way interaction term to the relevant linear regression models of the relationship between maternal psychological distress and externalising behaviour. The following process was used, and is described using gender as an example.

1. The full regression model is run including gender as a covariate.
2. The full regression model is run again including gender as a covariate and also the two-way interaction term (the two-way interaction term is derived, e.g. maternal psychological distress at wave 1 x gender of child).
3. A post-regression Wald test is run to check whether the addition of the interaction term to the model is statistically significant.

Statistical significance was set at 5%, with a Wald test of p-value 0.05 or below denoted as statistically significant and indicative of an interaction. Interaction tests are known to have low statistical power;[281] therefore any borderline significant result was also retested using the larger sensitivity sample, which would add power to the analyses. Where there was evidence of effect modification, the association between

maternal psychological distress and child externalising behaviour by each level of the effect-modifier (e.g. boys/girls) was plotted to examine the effect.

3.5.4 Testing the bidirectional relationship

Linear regression analysis was used to test the bidirectionality of the relationship between maternal psychological distress and child externalising behaviour at MCS2 and MCS3. The relationship at MCS1 could not be included, as there was not a comparative measure of child externalising behaviour at nine months. The analyses were conducted in stages, as described by Hannington and colleagues.[282] To test the mother-to-child effects, linear regression analyses were conducted in the following four stages:

1. Model the relationship between maternal psychological distress at three years (MCS2) and child externalising behaviour at five years (MCS3).
2. Repeat step one, controlling for child externalising behaviour at three years (MCS2).
3. Repeat step one, controlling for maternal psychological distress at five years (MCS3).
4. Repeat step one, controlling for both child externalising behaviour at three years (MCS2) and maternal psychological distress at five years (MCS3).

The final model, stage four, is used to assess the strength of the independent effects of maternal psychological distress at MCS2 on child externalising behaviour at MCS3 while effectively controlling for the child-to-mother effects.

To test the child-to-mother effects, linear regression analyses were conducted in the following four stages:

1. Model the relationship between child externalising behaviour at three years (MCS2) and maternal psychological distress at five years (MCS3).
2. Repeat step one, controlling for maternal psychological distress at three years (MCS2).
3. Repeat step one, controlling for child externalising behaviour at five years (MCS3).
4. Repeat step one, controlling for both maternal psychological distress at three years (MCS2) and child externalising behaviour at five years (MCS3).

Again, the final model, stage four, is used to assess the strength of the independent effects of child externalising behaviour at MCS2 on maternal psychological distress at MCS3 while effectively controlling for the mother-to-child effects.

3.5.5 Mediation analyses

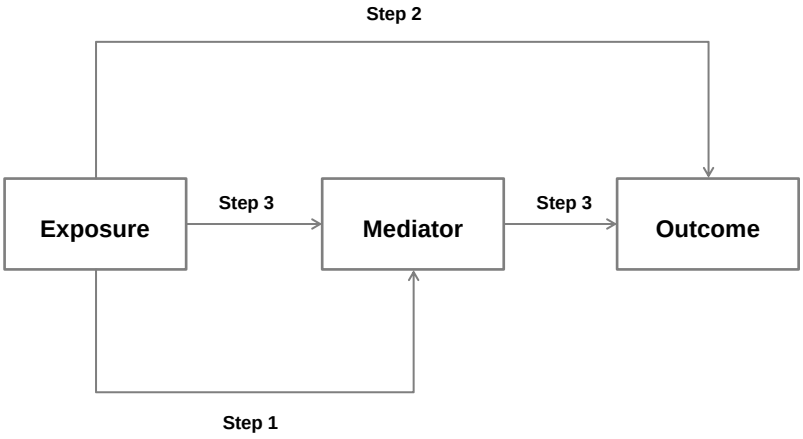
Mediation analysis is used to indirectly assess the effect of a hypothesised causal factor on an outcome through the proposed mediator. A variable may function as a mediator to the extent that it is deemed to lie on the causal pathway between the exposure and the outcome, and statistically accounts for the relation between one variable (the explanatory) and another (the outcome) variable. Mediators have been described as potentially explaining how external physical or social events or circumstances take on internal psychological significance.[283] In addition, they are described as pathway variables, acting as a plausible link between one phenomenon and another. The approach used in the analysis is that described by

Baron and Kenny (see Figure 3.5), and is particularly used in studies of mediation that explore relationships between continuous variables longitudinally.[284;285] An example is used to describe the mediation process in the relationship between maternal psychological distress and child externalising behaviour with a hypothesised mediator of mother-child relationship.

Baron and Kenny's mediation analysis consists of a three-stage regression model, as follows:

1. Regress the mediator on the exposure variable (e.g. mother-child relationship score at three years (MCS2) on maternal psychological distress at nine months (MCS1)).
2. Regress the outcome variable on the exposure variable (e.g. child externalising behaviour at five years (MCS3) on maternal psychological distress at nine months (MCS1)).
3. Repeat step two, controlling for the mediator variable (e.g. child externalising behaviour at five years (MCS3) on maternal psychological distress at nine months (MCS1), controlling for mother-child relationship score at three years (MCS2)).

Figure 3.5 Mediation analysis process



Mediation is assessed using the following conditions, which must be met for mediation to be confirmed:

1. The exposure variable (maternal psychological distress at nine months (MCS1)) must be associated with the mediator variable (mother-child relationship at three years (MCS2)) in step one.

2. The exposure variable (maternal psychological distress at nine months (MCS1)) must be associated with the outcome variable (child externalising behaviour at five years (MCS3)) in step two.

3. The step-two regression coefficient must be attenuated after controlling for the mediator (parent-child relationship at three years (MCS2)) in step three.

If the mediation conditions hold in the predicted direction, then the effect of the exposure variable on the outcome variable must be weaker at step three than at step two. Perfect mediation would hold if the association in the step-two model were completely attenuated after the mediator was controlled for (step three).

This chapter has described the methods to be used to test the thesis hypotheses set out in chapter two. The following chapter presents the results of analyses aimed at addressing objective one of the thesis and testing the associated hypotheses.

Chapter 4: The relationship between maternal psychological distress and childhood externalising behaviour

Objective 1: To examine the longitudinal association between maternal psychological distress symptoms in the early years and child externalising behaviour symptoms at five years, testing lifecourse models of sensitive periods and accumulation, the bidirectionality of the relationship, and potential differences by gender and family structure.

4.1 Introduction

An association between maternal psychological distress and child socio-emotional behaviour is now well documented and almost universally accepted.[7-17;66;67] A review of this literature found studies to be heterogeneous with respect to sample size, measures used for maternal psychological distress and child socio-emotional behaviour, age ranges of children, study design and country context. A number of studies have been conducted on very small case-defined samples, either of mothers with diagnosed depression or of children with diagnosed behavioural disorder, while larger cross-sectional studies had wide variations in children's ages.[7;10;16;69;70;181;182] Meta-analyses examining the association between maternal depression and child externalising behaviour[17;179] have found significant effects of maternal depression on child externalising behaviour, although they are only able to report unadjusted associations, as control variables are too varied to compare adjusted analyses. More recent studies have explored gender and family structure differences in the association between maternal psychological distress and child socio-emotional behaviour.[71;143] One cross-sectional study found the effects of maternal psychological distress on teacher-rated socio-emotional development assessments at five years to be stronger for boys.[71] While another study exploring the longitudinal

relationship between maternal psychological distress at nine months and child externalising behaviour at three years found that the relationship operated similarly in both two-parent and single-mother families.[143] This thesis aims to contribute to research in this area by examining potential gender and family structure differences in the longitudinal association between maternal psychological distress symptoms at nine months and three years, and child externalising behaviour symptoms at five years. The first three hypotheses relate to this objective and state:

1a There is a direct association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years, so that as maternal psychological distress symptoms increase, so do child externalising behaviour symptoms.

1b The direct association between maternal psychological distress at nine months and three years and child externalising behaviour at five years is stronger for boys than for girls.

1c The direct association between maternal psychological distress at nine months and three years and child externalising behaviour at five years is stronger in single-mother families than in two-parent families.

The timing of events and stressors in a child's life, as well as the historical context in which a child is raised, are thought to have an important influence on a child's development and later health and well-being.[88;103-105] Lifecourse theory offers an explicit framework within which to examine the potential temporal effects of exposure to maternal psychological distress on child externalising behaviour. A small number of studies have emerged over the last decade examining lifecourse effects in the association between maternal depression and child socio-emotional

behaviour.[103-105] Findings thus far suggest that the severity, chronicity and temporal closeness of maternal depressive symptoms are associated with increased behaviour problems at age five.[103] Prenatal exposure to maternal depressive symptoms appears to have no association with later externalising behaviour problems, while exposure in the first few years of life has been found to predict child externalising behaviour problems in children aged five, seven and 12 years.[104;105] There is also some evidence that exposure to maternal psychological distress in early childhood may have a greater effect on boys than girls.[88;93;106-108] In this chapter, two lifecourse hypotheses are tested, sensitive period and accumulation, and they are examined separately by gender.

1d Exposure to high maternal psychological distress at nine months only (sensitive period) is associated with a higher mean externalising behaviour score at five years in boys compared with exposure at three years only, while exposure to high maternal psychological distress at three years only (sensitive period) is associated with a higher mean externalising behaviour score at five years in girls compared with exposure at nine months only.

1e Exposure to high maternal psychological distress at both nine months and three years (accumulation) is associated with a higher mean child externalising behaviour score at five years, compared with exposure to high maternal psychological distress at either nine months only or three years only, or neither, in boys and girls.

Development theorists have long been proponents of the bidirectional nature of the mother-child relationship.[73;78;79] Despite this, examination of the relationship between maternal psychological distress and child externalising behaviour has largely

focused on potential mother-to-child effects. More recent research has emerged which examines both the mother-to-child and child-to-mother association between maternal psychological distress and child externalising behaviour, with mixed results.[83-85] For example, one study found evidence of a stronger effect from mother to child,[83] while another found evidence of equal effect strength for mother-to-child and child-to-mother associations.[85] This study aims to contribute to this evidence by examining the mother-to-child and child-to-mother effects longitudinally from age three years to five years for the association between maternal psychological distress and child externalising behaviour and vice versa. Although boys are more likely to have externalising behaviour symptoms than girls in the early years,[23] there is little evidence to show whether there is a gender difference in child-to-mother effects; this is therefore examined separately for boys and girls. The final hypothesis to be tested in this chapter states:

1f There is a bidirectional association between maternal psychological distress and child externalising behaviour at three years and five years, with a stronger overall effect from mother to child than from child to mother. There is a significant gender difference in child-to-mother effects, so that this relationship is stronger for boys than for girls.

4.2 Results

The results begin with a description of the distribution of the main outcome variable (child externalising behaviour score), the main exposure variables (maternal psychological distress score at nine months and three years, and a longitudinal measure of high maternal psychological distress) and the a priori identified covariates of family structure at nine months and three years, birthweight, gender, child's age group at wave 3 (months), mother's age group at birth (years), and birth order. Results are shown stratified by gender (Table 4.1) and family structure (Table 4.2). Following the description of these variables, each hypothesis in turn forms the focus of a subsequent section, and analyses are conducted to test each hypothesis and the results reported.

4.2.1 The distribution of child externalising behaviour, maternal psychological distress and the covariates

The weighted mean and SE are reported for the continuous variables, and the unweighted base number and weighted percentage are reported for the categorical and binary variables. Differences are tested for statistical significance in the distribution of repeated measures across MCS waves, and are reported in the text and by gender and family structure respectively, and also reported in the tables.

Table 4.1 presents details of the distribution of externalising behaviour, maternal psychological distress and the covariates in the study sample by gender.

Table 4.1 Gender differences in child externalising behaviour, maternal psychological distress and covariates

Outcome, exposures and covariates	Boys (n=3,301)		Girls (n=3,202)	
	Mean	SE	Mean	SE
Child externalising behaviour score				
3 years [0–20]	6.6*	0.08	5.8*	0.08
5 years [0–20]	4.8*	0.06	3.8*	0.07
Maternal psychological distress score				
9 months [0–9]	1.5	0.04	1.4	0.03
3 years [0–24]	3.1	0.06	3.0	0.07
5 years [0–24]	2.8	0.07	2.8	0.07
	n	%	n	%
High maternal psychological distress				
Neither 9 months nor 3 years	2,733	84.8	2,687	85.7
9 months only	282	7.4	265	7.6
3 years only	151	4.1	136	3.9
9 months and 3 years	135	3.8	114	2.8
Family structure				
9 months				
Single-mother	432	9.7	407	10.0
3 years				
Single-mother	468	12.1	461	11.9
Birthweight (kg)				
<2.5	148	4.4	175	5.4
Child's age group at MCS3 (months)				
< 58	213	7.3	215	7.2
58–60	814	26.2	770	23.7
61–63	1,202	36.5	1,222	38.2
64–66	871	25.4	818	26.6
67–69	180	4.3	154	4.0
70 plus	21	0.3	23	0.4
Mother's age group at birth (years)				
14–19	226	5.1	195	4.8
20–24	507	12.8	514	13.7
25–29	949	28.4	902	28.7
30–34	1,054	34.2	1,081	35.7
35 plus	565	19.5	510	17.2
Birth order				
First	1,521	46.0	1,424	45.3
Second	1,170	36.7	1,182	37.2
Third	441	12.9	421	12.9
Fourth or later	169	4.4	175	4.6

*Significant gender difference.

Boys' (n=3,301) and girls' (n=3,202) mean externalising behaviour scores were nearly two points higher at three years than at five years, and this difference was statistically significant. The mean externalising behaviour score at both three years and five years was also significantly higher in boys than girls at both time points. Mean maternal psychological distress scores across MCS1 and MCS2 waves were not tested for statistical difference, as the measures differed. Comparison of mean maternal psychological distress score by gender cross-sectionally at nine months, three years and five years found no significant differences. The longitudinal measure of high maternal psychological distress shows that the majority of the study mothers (boys 85%, girls 86%) did not have high psychological distress at either nine months or three years. Of the mothers with high psychological distress at one time point, just over twice the proportion had high psychological distress at nine months (boys 7%, girls 8%) compared with three years (boys and girls 4%). A small proportion of mothers (boys 4%, girls 3%) had high psychological distress at both nine months and three years. There was no significant difference in the distribution of high maternal psychological distress by gender of child. For family structure, around 90% of the study sample were two-parent families (n=5,664) and 10% were single mothers (n=839). This percentage of single mothers is lower than the UK average of 20%,[140;286] and this may be partly due to the younger age of the cohort families, who had thus had less time to break up. The proportion of single mothers is similar to that in the total MCS sample of families with a biological mother, suggesting the complete-case sample (n=6,503) is representative of the MCS sample for family structure. At MCS3, 88% of the children were five years old or just under, with the age in months ranging from 53 to 72 months old. The mothers' age at the birth of the cohort child ranged from 14 to 47 years old, with a mean age of 30 years. This is in keeping with the mean age at first birth in the UK, which in 2008 was reported as 28 years old.[192] Teenage mothers made up around 5% of the study sample, and the

largest age group of mothers was 30–34 years old (35%). For birth order, just under half (46%) of the cohort children were the firstborn surviving child, while fewer than 5% were the fourth or subsequent child born. There were no statistical differences found for high maternal psychological distress or the mother and child covariates by gender.

Details of the distribution of externalising behaviour, maternal psychological distress and the covariates in the study sample by family structure are presented in Table 4.2. Comparing two-parent and single-mother families, a general pattern emerged of much poorer outcomes in single-mother than two-parent families. Children from single-mother families had significantly higher mean child externalising behaviour scores at both three years and five years compared with the children from two-parent families. In addition, single mothers had significantly higher mean psychological distress scores at nine months, three years and five years compared with coupled mothers. A higher proportion of single mothers had high maternal psychological distress at nine months, three years, and both nine months and three years, compared with coupled mothers. The distribution of the children's age groups was similar for single-mother and two-parent families, while mothers' age groups varied significantly between coupled and single-mothers. Around three quarters of single mothers were aged 13 to 29 years when they gave birth to the cohort child, compared with around two fifths of coupled mothers, making coupled mothers a significantly older cohort than single mothers. In addition, a significantly higher proportion of single mothers had a low birthweight cohort baby.

Table 4.2 Family structure differences in child externalising behaviour, maternal psychological distress and covariates

Outcome, exposures and covariates	Two parents (n=5,664)		Single mother (n=839)	
	Mean	SE	Mean	SE
Child externalising behaviour score				
3 years [0–20]	6.0*	0.07	7.6*	0.16
5 years [0–20]	4.2*	0.05	5.5*	0.13
Maternal psychological distress score				
9 months [0–9]	1.4*	0.03	1.9*	0.08
3 years [0–24]	3.0*	0.05	4.1*	0.16
5 years [0–24]	2.7*	0.05	3.7*	0.17
	n	%	n	%
High maternal psychological distress				
Neither 9 months nor 3 years	4,797	86.3*	623	75.3*
9 months only	462	7.2*	85	10.5*
3 years only	227	3.7*	60	6.7*
9 months and 3 years	178	2.8*	71	7.6*
Child's gender				
Boys	2,869	50.8	432	50.1
Girls	2,795	49.2	407	49.9
Birthweight (kg)				
≥2.5	5,400	95.4*	780	92.9*
<2.5	264	4.6*	59	7.1*
Child's age group at MCS3 (months)				
< 58	373	7.2	55	7.4
58–60	1,370	24.7	214	27.1
61–63	2,126	37.5	298	36.1
64–66	1,476	26.1	213	25.1
67–69	281	4.2	53	3.9
70 plus	38	0.3	6	0.4
Mother's age group at birth (years)				
13–19	201	2.9*	220	23.6*
20–24	774	11.9*	247	25.6*
25–29	1,670	28.9*	181	24.9*
30–34	2,019	37.1*	116	14.8*
35 plus	1,000	19.2*	75	11.2*
Birth order				
First	2,481	44.6*	464	54.6*
Second	2,125	37.9*	227	28.4*
Third	775	13.1*	87	10.8*
Fourth or later	283	4.4*	61	6.1*

*Significant family structure difference.

Birth order distribution also varied significantly by family structure, and for a larger proportion of single mothers the cohort child was either their firstborn surviving child or their fourth or subsequent child, while for coupled mothers the cohort child was more likely to be their second or third child.

The description of externalising behaviour, maternal psychological distress and the covariates in the study sample by gender and family structure has revealed some key patterns. Firstly, maternal psychological distress did not differ significantly in mothers by gender of child, whereas externalising behaviour was significantly higher in boys compared with girls. There were no significant gender differences in the other covariates. Secondly, single mothers appear to fair much worse in respect of maternal psychological distress than coupled mothers, and their children appear to have poorer externalising behaviour outcomes at age five years. Several of the covariates were also significantly different by family structure, suggestive of poorer outcomes in single-mother families.

4.2.2 Testing the association between maternal psychological distress and child externalising behaviour

Hypothesis 1a: There is a direct association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years, so that as maternal psychological distress symptoms increase, so do child externalising behaviour symptoms.

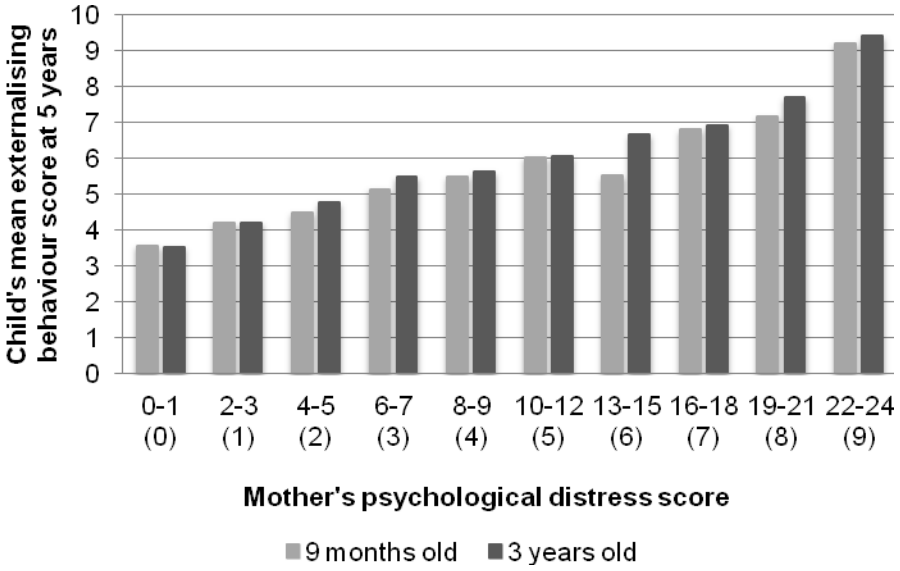
The analysis to test hypothesis 1a consisted of four main steps. Firstly, the crude associations were tested between child externalising behaviour at five years (main outcome) and maternal psychological distress at nine months and three years (main exposures). This is an important first step, since if no crude association is found a

relationship can quickly be ruled out. Secondly, the bivariate relationship between child externalising behaviour score at five years and maternal psychological distress score at nine months and three years was plotted in a bar chart to illustrate the pattern of the potential association and help to distinguish whether this was a dose-response association, as hypothesised. Thirdly, the crude association was tested between maternal psychological distress at nine months and three years, and child externalising behaviour score at five years, and the a priori identified covariates of family structure at nine months and three years, mother's age at birth in years, birthweight, gender, child's age at MCS3, and birth order. An a priori decision was made to retain the covariates for use in the multiple regression analysis if they were significantly associated with the main outcome, main exposures or both in the total study sample (n=6,503). The retained covariates would then be used as control variables in all of the regression analyses across the different stratified samples. This was to ensure a uniform approach and comparability across the stratified samples. The statistical tests of association used in the analysis are described in the methods chapter and reported in the tables. Lastly, multivariate linear regression models were run to test hypothesis 1a of an association between maternal psychological distress score at nine months and three years and child externalising behaviour score at five years, controlling for the significant covariates.

In the first test, the crude bivariate associations between maternal psychological distress score at nine months and three years and child externalising behaviour score at five years were all highly significant ($p \leq 0.001$) in the expected (positive) direction in the total study sample (n=6,503) (not shown). This meant an association between maternal psychological distress and child externalising behaviour could not be ruled out. The second test, of the bivariate association between child externalising behaviour score at five years and maternal psychological distress

score at nine months and three years, is illustrated in Figure 4.1. The figure shows a positive gradient increase in the mean child externalising behaviour score at five years, with increasing maternal psychological distress scores at nine months and three years, which can be described as a dose-response association. The highest maternal psychological distress scores are associated with a three times higher mean child externalising behaviour score at five years than the lowest scores. Identifying a dose-response relationship is important in epidemiology, as this constitutes one of the criteria used to indicate causation (see Appendix 4.1).[287]

Figure 4.1 Mean child externalising behaviour score at five years by maternal psychological distress score at nine months and three years (n=6,503)



Thirdly, the distribution and crude tests of association for mean maternal psychological distress score at nine months and three years and mean child externalising behaviour score at five years, with the a priori identified covariates, were conducted, and the results are presented in Table 4.3.

Table 4.3 Maternal psychological distress and child externalising behaviour by covariates

Covariates	Total study sample (n=6,503)			
		Maternal psychological distress		***Externalising behaviour***
		9 months	**3 years**	**5 years**
	n	Mean (SE)	Mean (SE)	Mean (SE)
Family structure				
9 months				
Two-parents	5,664	1.4 (0.03)	–	4.2 (0.05)
One-parent	839	1.9 (0.08)	–	5.5 (0.13)
*p-value***		*<0.001*		*<0.001*
3 years				
Two-parents	5,574	–	2.9 (0.04)	4.2 (0.06)
One-parent	929	–	4.4 (0.17)	5.4 (0.11)
*p-value***			*<0.001*	*<0.001*
Gender				
Boy	3,301	1.5 (0.04)	3.1 (0.06)	4.8 (0.06)
Girl	3,202	1.4 (0.03)	3.0 (0.07)	3.8 (0.07)
*p-value***		*0.088*	*0.403*	*<0.001*
Birthweight (kg)				
≥2.5	6,180	1.5 (0.03)	3.1 (0.05)	4.3 (0.05)
<2.5	323	1.7 (0.12)	3.3 (0.24)	4.9 (0.20)
*p-value***		*0.012*	*0.091*	*0.001*
Child's age group at MCS3 (mths)				
< 58	428	1.5 (0.09)	3.3 (0.19)	4.6 (0.17)
58–60	1,584	1.4 (0.05)	2.9 (0.10)	4.4 (0.10)
61–63	2,424	1.5 (0.04)	3.1 (0.08)	4.2 (0.08)
64–66	1,689	1.4 (0.04)	3.1 (0.09)	4.2 (0.09)
67–69	334	1.6 (0.11)	3.5 (0.23)	4.3 (0.20)
70 plus	44	1.2 (0.33)	2.5 (0.40)	3.5 (0.35)
*p-value***†		*0.021*	*0.189*	*0.006*
Mother's age group at birth (yrs)				
13–19	421	2.0 (0.12)	4.8 (0.28)	5.7 (0.23)
20–24	1,021	1.7 (0.07)	3.7 (0.15)	5.3 (0.12)
25–29	1,851	1.4 (0.04)	3.0 (0.08)	4.3 (0.09)
30–34	2,135	1.3 (0.04)	2.7 (0.07)	4.0 (0.08)
35 plus	1,075	1.5 (0.06)	2.9 (0.10)	3.9 (0.10)
*p-value**		*<0.001*	*<0.001*	*<0.001*
Birth order				
First	2,945	1.4 (0.04)	3.0 (0.07)	4.3 (0.08)
Second	2,352	1.5 (0.04)	2.9 (0.08)	4.3 (0.08)
Third	862	1.5 (0.06)	3.3 (0.14)	4.5 (0.13)
Fourth or later	344	1.7 (0.11)	3.8 (0.28)	4.4 (0.22)
*p-value**		*0.017*	*0.003*	*0.616*

*Kruskal-Wallis (X^2). ** Wilcoxon (z). ***Spearman (t). †Age in days.

Single mothers were more likely than coupled mothers to have psychological distress, and children of single mothers were more likely than children of coupled mothers to have externalising behaviour problems. Maternal psychological distress in the early years and child externalising behaviour problems at five years were associated with a younger maternal age at birth. At five years, boys had a significantly higher mean externalising behaviour score than girls, while older cohort children had a significantly lower mean externalising behaviour score than younger cohort children. Low birthweight was significantly associated with externalising behaviour at five years, and with maternal psychological distress at nine months but not at three years. Lastly, earlier birth order was significantly associated with lower maternal psychological distress at nine months and three years, but not with externalising behaviour at five years. Identifying potential confounding variables and risk factors is an important step in testing an association, particularly when using large cohort datasets with potentially large numbers of confounding variables. On the basis of the results of the crude tests of association, all of the a priori identified mother and child covariates were retained for use in the multivariate linear regression models.

Unadjusted and adjusted linear regression models were run to test hypothesis 1a of an association between maternal psychological distress score at nine months and three years and child externalising behaviour at five years in the total study sample (Table 4.4). A significant positive association was found between maternal psychological distress score at nine months and three years and child externalising behaviour score at five years in the unadjusted models. The 95% confidence intervals (CI), which represent a 95% probability that the true coefficient for the child externalising behaviour score lies within this range, were narrow, with the upper and lower range indicating a significantly higher score. The 95% confidence interval did

not cross the value zero, meaning the result was statistically significant. A one point increase in maternal psychological distress score at nine months predicted nearly half a point increase in child externalising behaviour score at five years, while a one point increase in maternal psychological distress score at three years predicted around a quarter point increase in child externalising behaviour score at five years.

Table 4.4 Relationship between maternal psychological distress at nine months and three years, and child externalising behaviour score at five years

Maternal psychological distress	Child externalising behaviour score (5 years)				
		Unadjusted		Model 1*	
	n	Coeff.	95% CI	Coeff.	95% CI
9 months	6,503	0.46	0.40, 0.52	0.41	0.36, 0.46
3 years	6,503	0.25	0.22, 0.28	0.22	0.20, 0.25

*Model one adjusted for: family structure (nine months or three years concurrent with maternal psychological distress), gender, birthweight, child's age at MCS3 (days), mother's age at birth (years), mother's age squared, birth order.

Maternal psychological distress at nine months and three years remained significantly predictive of child externalising behaviour at five years after adjusting for the mother and child covariates (model one). In the adjusted models, mother's age (in years) squared was additionally adjusted for to account for any U-shaped association between maternal age at birth and child externalising behaviour along with the other covariates. After controlling for the mother and child covariates, the association between maternal psychological distress at nine months was attenuated by around 11% and at three years by around 12%, as illustrated by the reduction in the regression coefficient. Post-estimation tests of homoscedasticity, independence

of error terms, normal distribution of residuals and multicollinearity were run, and the assumptions were met.[216] These results suggest that the null hypothesis of no association between maternal psychological distress and child externalising behaviour can be rejected, and therefore support hypothesis 1a of a positive association between maternal psychological distress score at nine months and three years and child externalising behaviour score at five years in the study sample.

4.2.3 The moderating role of gender and family structure

Hypothesis 1b: The direct association between maternal psychological distress at nine months and three years and child externalising behaviour at five years is stronger for boys than for girls.

Hypothesis 1c: The direct association between maternal psychological distress at nine months and three years and child externalising behaviour at five years is stronger in single-mother families than in two-parent families.

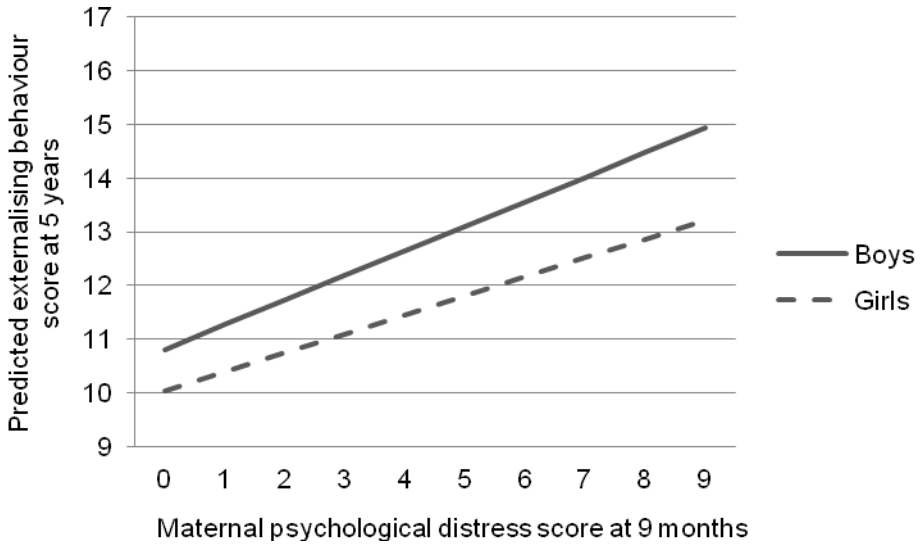
In order to test hypotheses 1b and 1c, interaction terms were introduced into the adjusted linear regression models used to test hypothesis 1a of an association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years. Two-way interaction terms were derived to test for a moderating effect: by gender, 'maternal psychological distress (nine months) x gender' and 'maternal psychological distress (three years) x gender'; and by family structure, 'maternal psychological distress (nine months) x family structure (nine months)' and 'maternal psychological distress (three years) x family structure (three years)'. Each interaction term was added to the relevant regression model of the association between maternal psychological distress at nine

months or three years and child externalising behaviour at five years. Post-regression tests of significance (Wald test) for the added interaction term were conducted, with a p-value <0.05 denoting evidence of an interaction. The predicted linear regression estimates, including the interaction term, were then plotted in a line graph.

In the relationship between maternal psychological distress at nine months and child externalising behaviour at five years there was borderline evidence of a moderating effect by gender (p=0.062). The model was rerun using the larger sensitivity sample (n=10,888), as this would have more power to detect possible effect modification. In the larger sensitivity sample, the post-estimation Wald test became highly significant for the moderating effect by gender in the relationship between maternal psychological distress at nine months and child externalising behaviour at five years (p=0.006). In the relationship between maternal psychological distress at three years and child externalising behaviour at five years, there was no evidence of a moderating effect by gender (p=0.319) in the study sample. Again the model was rerun using the larger sensitivity sample, and the post-estimation Wald test became statistically significant (p=0.036) for the moderating effect by gender. Next, the role of family structure in moderating the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years was investigated. Regression models of the relationships were run, including the relevant interaction terms. There was no evidence of a moderating effect by family structure in the association between maternal psychological distress at nine months and three years and externalising behaviour at five years, either in the study sample or when rerun in the larger sensitivity sample.

The association between maternal psychological distress at nine months and externalising behaviour at five years including the interaction by gender was plotted (Figure 4.2) to examine the interaction.

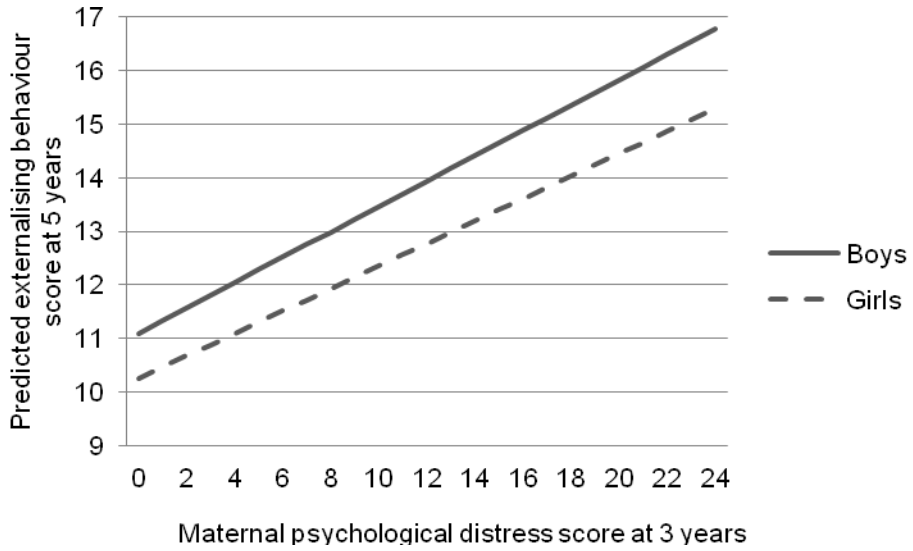
Figure 4.2 The relationship between maternal psychological stress score at nine months and externalising behaviour score at five years, by gender (n=6,503)



The association between maternal psychological distress at nine months and externalising behaviour at five years appeared stronger in boys than in girls, as illustrated by the steeper gradient of the regression line for boys.

Figure 4.3 illustrates the association between maternal psychological distress score at three years and externalising behaviour at five years including the interaction by gender. A marginally stronger association between maternal psychological distress at three years and externalising behaviour score at five years can be seen for boys than in girls.

Figure 4.3 The relationship between maternal psychological stress score at three years and externalising behaviour score at five years, by gender (n=6,503)



For comparison, the non-significant results for effect modification by family structure were plotted for the association between maternal psychological distress at nine months (Figure 4.4) and three years (Figure 4.5) and child externalising behaviour at five years. It is possible that as the sample of single mothers is relatively small the interaction test did not have sufficient power to detect effect modification. However, as can be seen in the figures, the association between maternal psychological distress at nine months (4.4) and three years (4.5) and externalising behaviour at five years appeared to be of similar strength in two-parent and single-mother families, as illustrated by the almost parallel regression lines. This serves to confirm the post-regression test results by family structure.

Figure 4.4 The relationship between maternal psychological stress score at nine months and externalising behaviour score at five years, by family structure (n=6,503)

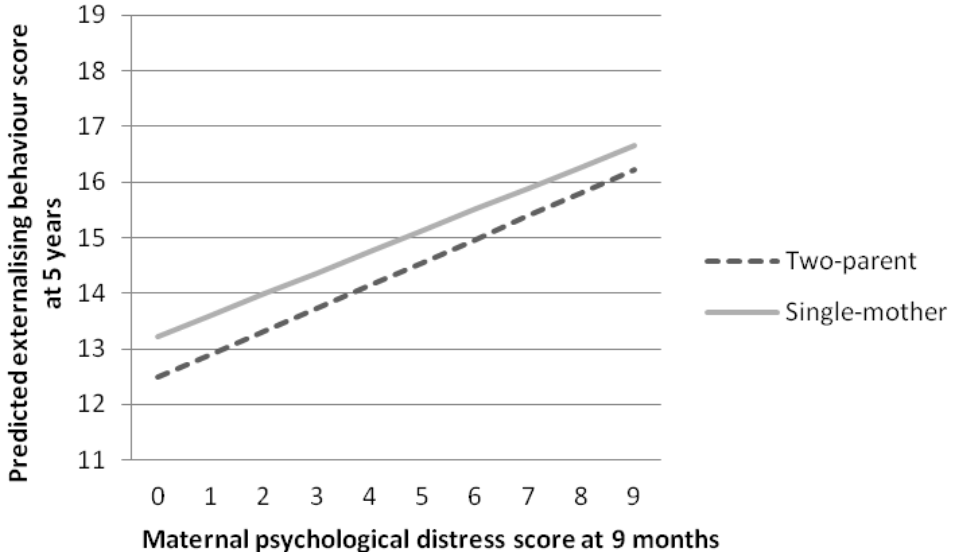
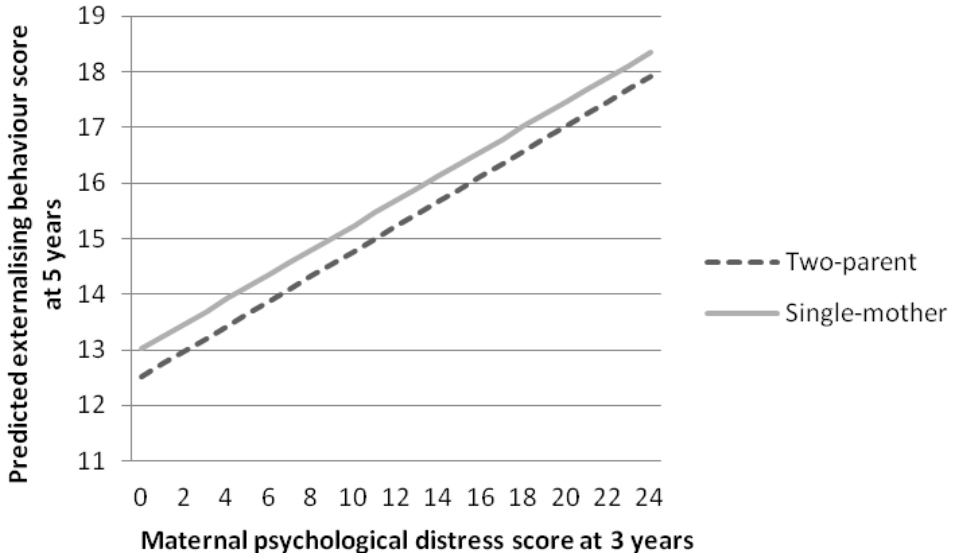


Figure 4.5 The relationship between maternal psychological stress score at three years and externalising behaviour score at five years, by family structure (n=6,503)



Following the identification of a moderating effect by gender in the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years, the linear regression models to test hypothesis 1a were rerun separately for boys and girls. This was to ensure that evidence of the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years applied to girls as well as boys.

In the unadjusted regression models, the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years remained significant and positive for both boys and girls (Table 4.5).

Table 4.5 Relationship between maternal psychological distress at nine months and three years and externalising behaviour score at five years, by gender

Maternal psychological distress	Child externalising behaviour score at 5 years				
		Unadjusted		Model 1*	
	n	Coeff.	95% CI	Coeff.	95% CI
BOYS					
9 months	3,301	0.50	0.42, 0.57	0.46	0.39, 0.54
3 years	3,301	0.26	0.22, 0.30	0.24	0.20, 0.28
GIRLS					
9 months	3,202	0.41	0.33, 0.48	0.35	0.27, 0.43
3 years	3,202	0.24	0.20, 0.28	0.21	0.17, 0.25

*Model one adjusted for: family structure MCS1 or MCS2, birthweight, child's age at MCS3 (days), mother's age at birth (years), mother's age squared, birth order.

The association between maternal psychological distress at nine months and three years and externalising behaviour at five years appeared stronger in boys compared with girls, as indicated by the larger coefficients for boys at both nine months and three years. For boys, a one point increase in maternal psychological distress score at nine months predicted a half a point increase in externalising behaviour score at five years, compared with a 0.4 point increase for girls. A one point increase in maternal psychological distress score at three years predicted a similar increase in externalising behaviour score at five years, again with a stronger effect evident in boys than girls. After controlling for the covariates of family structure (concurrent with psychological distress), birthweight, child's age at MCS3 in days, mother's age at birth in years (and mother's age squared) and birth order, the relationship between maternal psychological distress at nine months and externalising behaviour at five years was attenuated by around 8% in boys and 15% in girls, but remained significant and positive for both boys and girls. Similarly, the relationship between maternal psychological distress at three years and externalising behaviour at five years was attenuated by around 8% in boys and 13% in girls, but again remained significant and positive for both boys and girls.

4.2.4 Lifecourse effects in the relationship between maternal psychological distress and child externalising behaviour

Hypothesis 1d: Exposure to high maternal psychological distress at nine months only (sensitive period) is associated with a higher mean externalising behaviour score at five years in boys compared with exposure at three years only, while exposure to high maternal psychological distress at three years only (sensitive period) is associated with a higher mean externalising behaviour score at five years in girls compared with exposure at nine months only.

Hypothesis 1e: Exposure to high maternal psychological distress at both nine months and three years (accumulation) is associated with a higher mean child externalising behaviour score at five years, compared with exposure to high maternal psychological distress at either nine months only or three years only, or neither, in boys and girls.

The lifecourse hypotheses of sensitive period (1d) and accumulation (1e) were tested by running the linear regression models using the longitudinal measure of high maternal psychological distress. The unadjusted and adjusted models were run separately for boys and girls. The adjusted models controlled for the mother and child covariates of family structure (concurrent with maternal psychological distress), birthweight, child's age at MCS3 (days), mother's age at birth (years), mother's age squared, and birth order. Post-estimation tests were run for the adjusted linear regression models for homoscedasticity, independence of error terms, normal distribution of residuals and multicollinearity, and all of the assumptions were met.[216]

In the unadjusted model, high maternal psychological distress at the nine-month time point only and the three-year time point only, compared with at neither time point, predicted a similar-size increase in boys' externalising behaviour score at five years, of around 1.5 points (Table 4.6). In the adjusted models, the association between maternal psychological distress at nine months only and three years only was slightly attenuated, but remained positive and significant and of a similar strength at both time points. This result did not support the part of hypothesis 1d, which states that the effect of high maternal psychological distress will be greater at nine months only than three years only in boys. For the girls, the unadjusted association between exposure to high maternal psychological distress at nine months only, compared with exposure at neither time point, predicted a 0.86-point

higher externalising behaviour score at five years, while exposure to high maternal psychological distress at three years only predicted a 1.82-point higher externalising behaviour score at five years.

Table 4.6 The relationship between high maternal psychological distress at nine months, three years and both and child externalising behaviour score at five years, by gender

High maternal psychological distress	Child externalising behaviour score at 5 years				
		Unadjusted		Model 1*	
	n	Coeff.	95% CI	Coeff.	95% CI
BOYS					
Neither 9 months nor 3 years	2,733	0.00		0.00	
9 months only	282	1.46	0.96, 1.95	1.34	0.85, 1.84
3 years only	151	1.56	0.94, 2.18	1.29	0.68, 1.91
9 months and 3 years	135	3.22	2.49, 3.95	3.01	2.31, 3.71
GIRLS					
Neither 9 months nor 3 years	2,687	0.00		0.00	
9 months only	265	0.86	0.40, 1.32	0.71	0.24, 1.18
3 years only	136	1.82	1.09, 2.55	1.46	0.77, 2.15
9 months and 3 years	114	2.88	2.06, 3.70	2.53	1.72, 3.35

*Model one adjusted for: family structure MCS1 or MCS2, birthweight, child's age at MCS3 (days), mother's age at birth (years), mother's age squared, birth order.

After adjustment for the mother and child covariates this association was slightly attenuated, but it remained positive and significant, and stronger for high maternal psychological distress at three years than at nine months. This result supported the part of hypothesis 1d which states that exposure to high maternal psychological distress at three years only will be associated with a higher mean externalising

behaviour score at five years than exposure at nine months only, and compared with at neither nine months nor three years, in the girls.

Exposure to high maternal psychological distress at both nine months and three years, compared with at neither time point, had the strongest effect on externalising behaviour score at five years in both boys and girls, and was greater than for exposure at any single time point alone. This result supported hypothesis 1e that exposure to high maternal psychological distress at both nine months and three years (accumulation) is associated with a higher mean child externalising behaviour score at five years compared with exposure to high maternal psychological distress at either nine months only or three years only, or neither, in boys and girls.

4.2.5 The bidirectional relationship between maternal psychological distress and child externalising behaviour

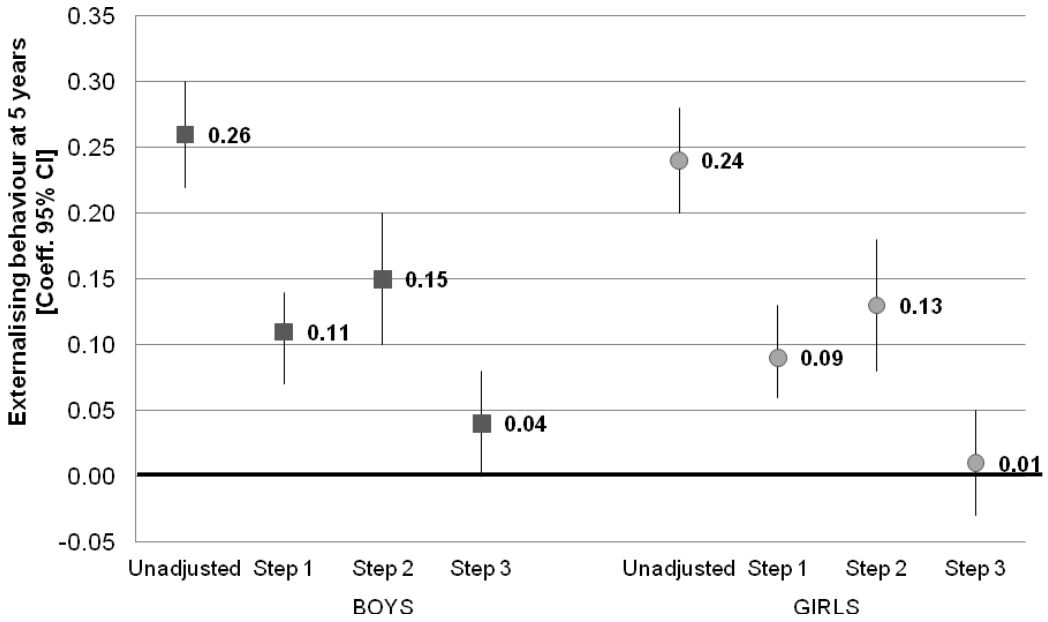
Hypothesis 1f: There is a bidirectional association between maternal psychological distress and child externalising behaviour at three years and five years, with a stronger overall effect from mother to child than from child to mother. There is a significant gender difference in child-to-mother effects, so that this relationship is stronger for boys than for girls.

The bidirectional association between maternal psychological distress and child externalising behaviour at three years and five years was tested by running linear regression models for the association between maternal psychological distress at three years and child externalising behaviour at five years, and for the association between child externalising behaviour at three years and maternal psychological distress at five years, while controlling for the concurrent measures and continuity

effects in the longitudinal relationship. The models were run separately for boys and girls.

Figure 4.6 shows the results of the four-step regression model used to test the mother-to-child association between maternal psychological distress at three years and child externalising behaviour at five years (coefficient and 95% CI), by gender.

Figure 4.6 Mother-to-child effects: the relationship between maternal psychological distress at three years and externalising behaviour at five years, by gender



Step 1 adjusts for: child externalising behaviour T2 (three years old)
Step 2 adjusts for: mother's psychological distress T3 (five years old)
Step 3 adjusts for: child externalising behaviour T2 and mother's psychological distress T3

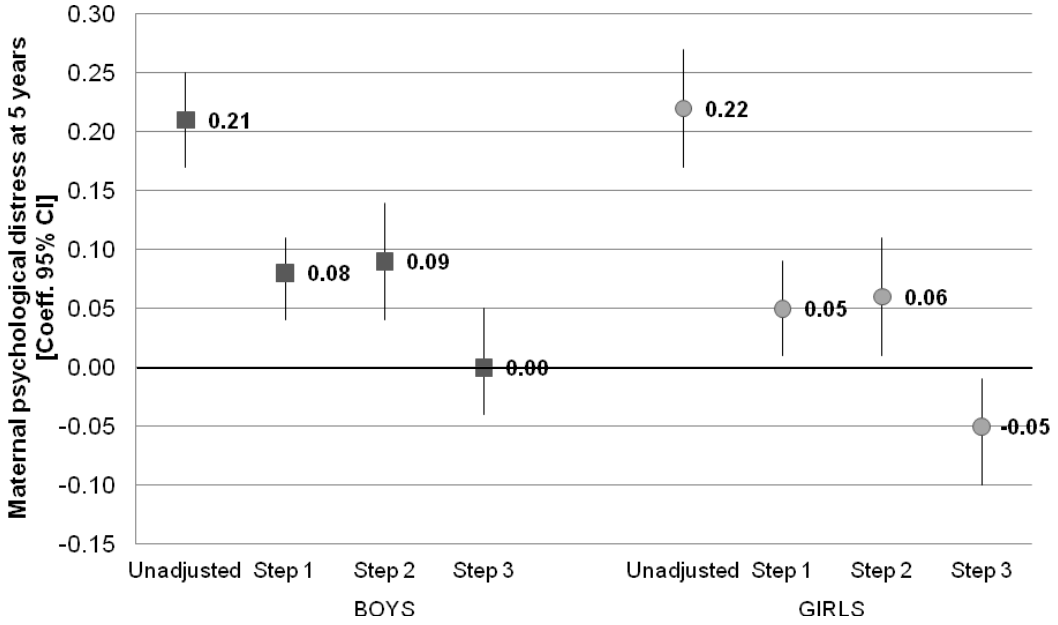
First came the unadjusted model results, second the model adjusted for child externalising behaviour at three years (step one), third the model adjusted for maternal psychological distress at five years (step two), and lastly the model

adjusted for both child externalising behaviour at three years and maternal psychological distress five years (step three). In the unadjusted model the association between maternal psychological distress at three years and externalising behaviour at five years was positive and significant for both boys and girls. Adjusting for maternal psychological distress at five years attenuated the association by 58% in the boys and 63% in the girls. Adjusting for child externalising behaviour at three years attenuated the association by 42% in the boys and 46% in the girls. After controlling for both the concurrent and continuity effects (step three), the association between maternal psychological distress at three years and child externalising behaviour at five years was attenuated by 85% in boys and 96% in girls. For the boys the association between maternal psychological distress at three years and child externalising behaviour at five years remained just significant, but was much weaker compared with the unadjusted association. This suggests that there is a longitudinal association between maternal psychological distress at three years and child externalising behaviour at five years after the effects of concurrent maternal psychological distress and the continuity effects of externalising behaviour are taken into account. For the girls the association between maternal psychological distress at three years and child externalising behaviour at five years became non-significant. This suggests that the longitudinal association between maternal psychological distress at three years and child externalising behaviour at five years is accounted for by the effects of concurrent maternal psychological distress and the continuity effects of externalising behaviour in girls.

Figure 4.7 shows the results of the four-step model used to test the child-to-mother association between child externalising behaviour at three years and maternal psychological distress at five years (coefficient and 95% CI), by gender. In the unadjusted model, boys' and girls' externalising behaviour at three years had a

positive and significant association with maternal psychological distress at five years. After controlling for maternal psychological distress at three years, the association was attenuated by 62% in the boys and 77% in the girls. After controlling for child externalising behaviour at three years, the association was attenuated by 57% in boys and 73% in girls.

Figure 4.7 Child-to-mother effects: the relationship between child externalising behaviour at three years and maternal psychological distress at five years, by gender



Step one adjusts for: mother's psychological distress T2 (three years old).
Step two adjusts for: child externalising behaviour T3 (five years old).
Step three adjusts for: mother's psychological distress T2 and child externalising behaviour T3.

In the final model, after controlling for the concurrent and continuity effects (step three), the association between boys' externalising behaviour at three years and maternal psychological distress at five years was completely attenuated and

became non-significant. In the girls, the association between externalising behaviour at three years and maternal psychological distress at five years became significant in the opposite direction, and was negatively associated with maternal psychological distress at five years. This result suggests there may be a protective longitudinal association between girls' externalising behaviour at age three and maternal psychological distress at five years after controlling for the effects of concurrent externalising behaviour and the continuity effects of maternal psychological distress.

Part of hypothesis 1f states that there will be a bidirectional association between maternal psychological distress and child externalising behaviour in both boys and girls. The results of the analyses to test mother-to-child effects suggest there is a longitudinal mother-to-son effect, but not a longitudinal mother-to-daughter effect. Conversely, there did not appear to be a longitudinal son-to-mother effect, but there did appear to a daughter-to-mother effect, although not in the predicted direction. The second part of hypothesis 1f states there will be a significant gender difference in child-to-mother effects so that this relationship will be stronger for boys than girls. In fact the results appeared to support a gender distinction such that the effect of girls' externalising behaviour at three years seemed to have a significant buffering effect on maternal psychological distress at five years, whereas for boys there appeared to be no son-to-mother effect.

4.3 Main findings and discussion

The objective of this chapter was to examine the longitudinal association between maternal psychological distress symptoms in the early years and child externalising behaviour symptoms at five years, testing lifecourse models of sensitive periods and

accumulation, the bidirectionality of the relationship, and potential differences by gender and family structure.

Firstly, evidence of a positive, significant, dose-response relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years was found. This association remained even after controlling for the covariates of family structure (concurrent with maternal psychological distress), mother's age at birth (years) and age squared, birthweight, gender, child's age at MCS3, and birth order. These results support hypothesis 1a of a positive association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years, and are consistent with existing evidence.[7-17;66;67] The thesis contributes to this body of research by specifically testing the longitudinal association between maternal psychological distress symptoms at two early-life time points, nine months and three years, and child externalising behaviour symptoms at five years. The contemporary nature of the sample means this evidence is currently relevant and is representative of the UK population.

Secondly, evidence of a moderating effect by gender was found in the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years. The evidence was consistent with a stronger association in boys compared with girls. Evidence of a moderating effect by family structure was not found. These results were in line with recent findings from studies also conducted using the MCS sample, which found a similarly stronger effect in the association between maternal psychological distress at nine months on socio-emotional adjustment at five years in boys compared with girls,[71] and no difference in the association between maternal psychological distress at nine months on child

externalising behaviour at three years by family structure.[143] The study which found evidence of a stronger association in boys compared with girls used a teacher-rated measure of socio-emotional adjustment at five years as the outcome of interest. The thesis results add to this evidence by investigating the moderating effect of gender on the association between maternal psychological distress at three years and child externalising behaviour at five years, and the moderating effect of family structure on the association between maternal psychological distress at three years and child externalising behaviour at five years. Evidence of a gender interaction in this association which used data sets other than the MCS could not be found. The moderating effect of gender appeared weaker for the association between maternal psychological distress at three years and externalising behaviour at five years, although any direct comparison with the association between maternal psychological distress at nine months and externalising behaviour at five years should be drawn cautiously, as the measures of maternal psychological distress used differed.

Thirdly, evidence of a differential lifecourse effect by gender was found. In boys there was evidence that exposure to high maternal psychological distress at either nine months only or three years only was associated with an equally detrimental effect on externalising behaviour score at five years. In girls there was evidence that exposure to high maternal psychological distress at three years only (sensitive period) was associated with a more detrimental effect on externalising behaviour score at five years, compared with exposure at nine months only. Other studies have found the temporal closeness of the exposure to high maternal psychological distress to be most detrimental to later externalising behaviour, and this is consistent with the thesis findings for girls.[103] This finding might indicate that girls are more resilient to exposure to high maternal psychological distress at nine months, or that

the effects are not as long-lasting as they are on boys. Alternatively, it may be that boys are more sensitive to exposure to maternal psychological distress at nine months, and that once exposed this sets them on a pathway to increased behavioural problems, which does not seem to be the case for girls. For both boys and girls, evidence was found that chronicity of maternal psychological distress, measured as high maternal psychological distress at both nine months and three years, was associated with the highest increase in behaviour problems at five years.[103] These results support the accumulation lifecourse model, which proposes that as the number, intensity or duration of exposures to unfavourable or favourable physical, social or psychological environments or events increase, effects accumulate to impact on health in a dose-response way.[101;102]

Lastly, the analysis that aimed to test the mother-to-child and child-to-mother effects found that girls' externalising behaviour at three years may be protective against maternal psychological distress at five years, after controlling for concurrent externalising behaviour and the continuity effects of maternal psychological distress at three years. Research to date which has examined the reciprocity of this relationship has found mixed results.[83-85] None of the studies reviewed had examined the reciprocal effect by gender. The results presented here should be viewed with some caution, as the relationships were examined without controlling for the effects of potential confounding factors. This was in part because potential covariates for each relationship would need to be different, and therefore may not strengthen the evidence.

Chapter 5: The role of early socio-economic position in the pathway to maternal psychological distress and child externalising behaviour

Objective 2: To examine the role of socio-economic position in early life (at nine months) in the association between maternal psychological distress symptoms in the early years and child externalising behaviour symptoms at five years, and to investigate potential differences by gender and family structure**.**

5.1 Introduction

This second study objective is important because much of the evidence to date has found both maternal and child mental health to be socially patterned, occurring to a greater degree in coincidence with socio-economic disadvantage.[19;26;50;288] This study tests the association between child externalising behaviour at five years and several different socio-economic indicators in early childhood: equivalised family income, below-60%-median income, self-rated financial status, maternal education, housing tenure and overcrowding. Each socio-economic position indicator was chosen because it has previously been found to be influential in early child development and socio-emotional adjustment. The first hypothesis to be tested in this chapter states:

2a There is an inverse association between early life socio-economic position (at nine months) and child externalising behaviour symptoms at five years, so that a lower socio-economic position is associated with higher child externalising behaviour symptoms at five years.

The FSM proposes a pathway triggered by socio-economic hardship and pressure that affects maternal psychological distress and consequently impacts on child externalising behaviour.[119] Theories related to gender differences in child externalising behaviour suggest that different stressors may have different effects on boys' and girls' socio-emotional behaviour.[169] For example, the effects of maternal high coercion and non-affection have been found to differ by gender. In addition, poorer child outcomes found in single-parent families have largely been attributed to socio-economic hardship.[133;141] The authors of the FSM propose that the pathway from economic pressure to maternal psychological distress and consequently to child outcomes operates similarly for single-parent families and two-parent families, and there is some evidence to support this.[143;144] Hypothesis 2b aims to test this pathway by gender and family structure, and states:

2b The relationship between early-life socio-economic position (at nine months) and child externalising behaviour symptoms at five years operates through its effects on maternal psychological distress at nine months and at three years. There will be no significant difference by gender, and a stronger effect for single-mother families compared with two-parent families.

There is some evidence from the US that the family stress model better explains the influence of economic hardship on child outcomes in families living below the poverty line.[130] The last hypothesis to be tested in this chapter states:

2c The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years is stronger within the context of disadvantage. There will be a stronger effect for boys compared with girls, and a stronger effect for single-mother families compared with two-parent families.

5.2 Results

5.2.1 The distribution of socio-economic position indicators

As in the previous results chapter, the weighted mean and standard error (SE) are reported for the continuous variables, and the unweighted base number and weighted percentage are reported for the categorical and binary variables. Differences are tested for statistical significance in the distribution by gender and family structure, and are reported in the text and tables.

Table 5.1 presents details of the distribution of the socio-economic position (SEP) variables by gender. Mean equivalised family income was around £386 per week in boys' and girls' families. Around 20% of the MCS families were living in relative poverty when the cohort child was nine months old, i.e. on a below-60%-median income. A higher proportion of families, around 30%, reported 'just about managing', finding it 'difficult' or 'very difficult' to manage financially. Nearly 90% of the mothers reported their highest educational qualification as NVQ levels 2–5, which is equivalent to a GCSE grade A–C (NVQ 2), two or more good A levels (NVQ 3), or a higher degree or professional qualification (NVQ 4–5). The remaining 10% of mothers reported their highest qualification as NVQ 1, other or overseas qualification, or none. A majority of the families owned their own accommodation

with or without a mortgage (75%), while only 5% of families reported living in overcrowded conditions. There were no significant differences found between the socio-economic position variables of the families of boys and girls.

Table 5.1 Indicators of early-life socio-economic position, by gender

Socio-economic position at 9 months	Boys (n=3,301)		Girls (n=3,202)	
	Mean	**SE**	**Mean**	**SE**
Equivalised family income	390.1	10.71	383.9	9.84
	n	%	n	%
Poverty				
Below-60%-median income	863	20.3	823	20.1
Self-rated financial status				
Living comfortably	889	29.5	906	30.8
Doing alright	1,324	39.3	1,222	37.2
Just about getting by	811	23.1	798	23.6
Finding it quite difficult	221	6.4	218	6.6
Finding it very difficult	56	1.7	58	1.8
Maternal education				
NVQ level 5	131	4.2	139	4.4
NVQ level 4	1,152	37.9	1,093	37.7
NVQ level 3	574	17.0	527	15.6
NVQ level 2	950	28.1	995	30.9
NVQ level 1	225	6.2	198	5.6
Other/overseas	43	1.1	30	0.9
None	226	5.5	220	5.0
Housing tenure				
Owner-occupier	2,336	75.7	2,244	74.0
Private rental	212	6.1	211	6.4
Local authority/social rental	585	13.7	599	15.5
Parents/rent-free	151	4.0	130	3.6
Other	17	0.5	18	0.5
Overcrowding				
Yes (<1 room per person)	185	4.5	196	5.3

In the two-parent families, mean equivalised family income (£480 per week) was around three times that found in the single-mother families (£162 per week) (Table

5.2). Around 15% of two-parent families lived below the 60%-median income line, compared with nearly three quarters of single-mother families.

Table 5.2 Indicators of early-life socio-economic position, by family structure

Socio-economic position at 9 months	Two parents [n=5,664]		Single-mother [n=839]	
	Mean	**SE**	**Mean**	**SE**
Equivalised family income	477.6*	10.38	161.8*	5.84
	n	**%**	**n**	**%**
Poverty				
Below-60%-median income	1,020	14.3*	666	74.5*
Self-rated financial status				
Living comfortably	1,721	32.5*	74	8.7*
Doing alright	2,266	39.0*	280	31.6*
Just about getting by	1,284	21.6*	325	39.3*
Finding it quite difficult	321	5.5*	118	15.4*
Finding it very difficult	72	1.4*	42	5.0*
Maternal education				
NVQ level 5	263	4.7*	7	1.0*
NVQ level 4	2,148	40.4*	97	13.9*
NVQ level 3	962	16.1*	139	18.0*
NVQ level 2	1,631	28.7*	314	36.3*
NVQ level 1	310	5.1*	113	13.0*
Other/overseas	64	1.0*	9	1.4*
None	286	4.0*	160	16.4*
Housing tenure				
Owner-occupier	4,465	81.3*	115	15.9*
Private rental	296	5.4*	127	14.8*
Local authority/social rental	743	10.8*	441	49.7*
Parents/rent-free	134	2.2*	147	18.2*
Other	26	0.4*	9	1.4*
Overcrowding				
Yes (<1 room per person)	322	4.8	59	5.9

*Significant family structure difference.

When asked to rate their financial status, more than two thirds of coupled mothers reported ‘doing alright’ or ‘living comfortably’, compared with around two fifths of

single mothers, with the majority of single mothers reporting they were ‘just about getting by’, finding it ‘quite difficult’, or ‘very difficult’ to manage. A small minority of coupled mothers (4%) had no qualifications when the cohort child was born, compared with around a sixth of single mothers. The majority of the two-parent families (81%) lived in their own home, while the majority of single mothers (84%) lived in local-authority or social rental housing, although few families lived in overcrowded conditions. The differences found in socio-economic position by family structure were all significant, with the exception of overcrowding. From this description of the socio-economic indicators in the sample it is clear that single mothers experience more socio-economic disadvantage than two-parent families.

5.2.2 Testing the association between socio-economic position and child externalising behaviour

Hypothesis 2a: There is an inverse association between early life socio-economic position (at nine months) and child externalising behaviour symptoms at five years, so that a lower socio-economic position is associated with higher child externalising behaviour symptoms at five years.

The analysis to test hypothesis 2a consisted of three stages. Firstly, crude tests of association were conducted between each of the SEP indicators at nine months and child externalising behaviour at five years (main outcome) and maternal psychological distress at nine months and three years (main exposures) in the study sample stratified by gender and family structure. Where a significant association was found between the SEP indicator and the exposures or outcome, this was highlighted as a potential covariate in the association between maternal psychological distress and child externalising behaviour. Covariates were later controlled for in the multivariate regression analysis. An a priori decision was made

to retain the SEP measures that were significantly associated with either the main outcome or main exposures in any of the stratified samples, to be used in the multivariate regression analysis across all samples. This was to ensure the multivariate regression analysis was comparable across the samples. Secondly, the bivariate distribution of mean child externalising behaviour scores at five years by each categorical SEP measure was explored to establish whether the associations were dose-response. Thirdly, multivariate linear regression models were run to test the association between each SEP indicator at nine months and child externalising behaviour score at five years (hypothesis 2a).

The results of the crude tests of association between each SEP measure (equivalised family income, 60%-below-median income, self-rated financial status, maternal education, housing tenure and overcrowding), maternal psychological distress score at nine months and three years, and child externalising behaviour score at five years are reported in Appendix 5.1 by gender and 5.2 by family structure. Key findings are summarised here in the text. The crude association between each SEP indicator at nine months and the main exposures and outcome were almost all highly significant ($p \leq 0.001$) in the sample of boys and girls and two-parent families, with the exception of overcrowding, which was not significantly associated with girls' externalising behaviour at age five. For the sample of single mothers the tests of association were more mixed, with a highly significant association found between self-rated financial status and maternal psychological distress at nine months and three years, maternal education and child externalising behaviour at five years, and housing tenure and maternal psychological distress at three years. The lack of significant association found between income and maternal psychological distress score at nine months and three years and child externalising behaviour score at five years may be partly explained by the smaller sample size,

which may have had insufficient power to detect an association. In addition, the majority of single mothers were socio-economically disadvantaged, and the sample may not have had enough internal variation to detect significant differences between groups. This is an important finding, as further analysis of the stratified sample of single mothers will have to consider these limitations. Taking account of the tests of association across all of the stratified samples, an association between each SEP measure, maternal psychological distress score at nine months and three years, and child externalising behaviour score at five years could not be ruled out. All of the SEP measures were therefore highlighted as covariates in the association between maternal psychological distress score at nine months and three years and child externalising behaviour score at five years, for later use in the regression analysis.

The mean child externalising behaviour score at five years by each categorical SEP indicator was plotted and examined by gender. Overcrowding and 60%-below-median income were not plotted, because they are binary measures and therefore cannot show a gradient association, which is the type of association to be tested in this section. An inverse gradient association was found between equivalised family income quintiles (Figure 5.1), self-rated financial status (Figure 5.2), maternal education (Figure 5.3) and three categories of housing tenure (owner-occupier, private rental and social housing) (Figure 5.4). This association was such that as SEP decreased, mean child externalising behaviour score at five years increased for boys and girls.

Figure 5.1 Mean child externalising behaviour score at five years in boys and girls by equivalised family income quintile at nine months

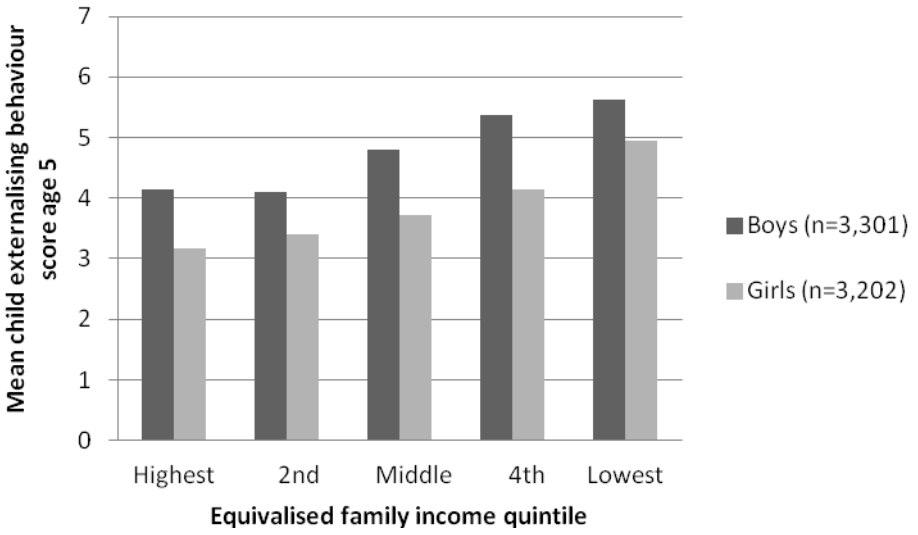


Figure 5.2 Mean child externalising behaviour score at five years in boys and girls by self-rated financial status at nine months

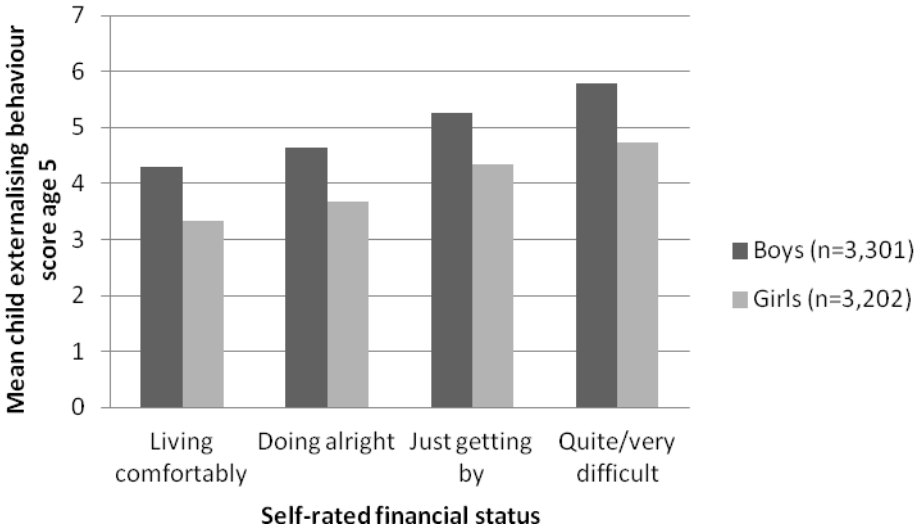


Figure 5.3 Mean child externalising behaviour score at five years in boys and girls by maternal educational level at nine months

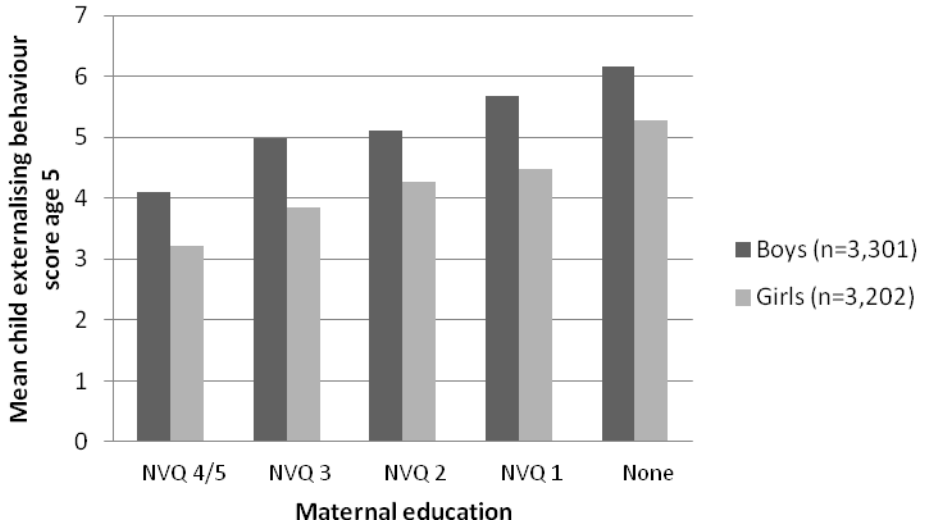
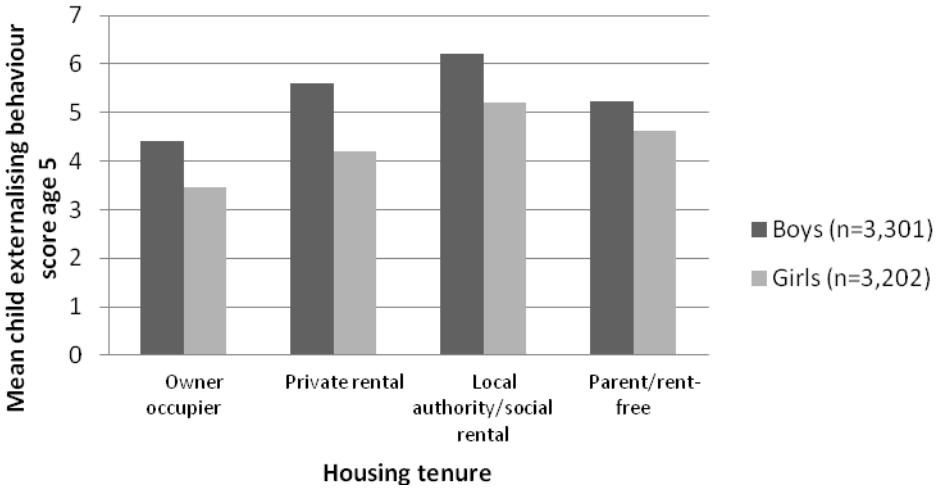


Figure 5.4 Mean child externalising behaviour score at five years in boys and girls by housing tenure at nine months



The gradient association between mean externalising behaviour score and each SEP measure appeared to be similar for boys and girls, although boys had a consistently higher mean externalising behaviour score across each SEP category. This was expected in light of the overall higher mean externalising behaviour score at five years in boys compared with girls.

The same charts showing mean child externalising behaviour score at five years by each categorical SEP indicator were plotted by family structure. In two-parent families an inverse gradient association was found between child externalising behaviour score at five years and equivalised family income quintiles (Figure 5.5), self-rated financial status (Figure 5.6), maternal education (Figure 5.7) and three categories of housing tenure (owner-occupier, private rental and social housing) (Figure 5.8).

Figure 5.5 Mean child externalising behaviour score at five years in two-parent and single-mother families by equivalised family income quintile at nine months

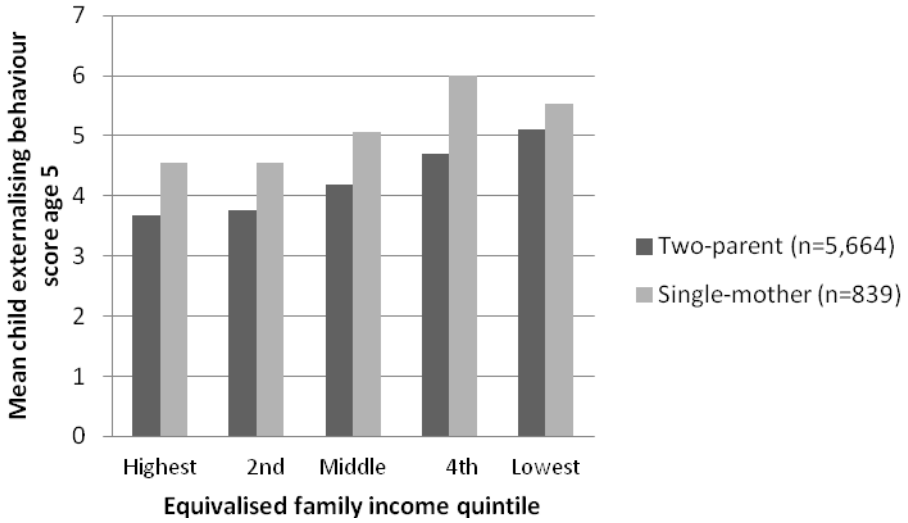


Figure 5.6 Mean child externalising behaviour score at five years in two-parent and single-mother families by self-rated financial status at nine months

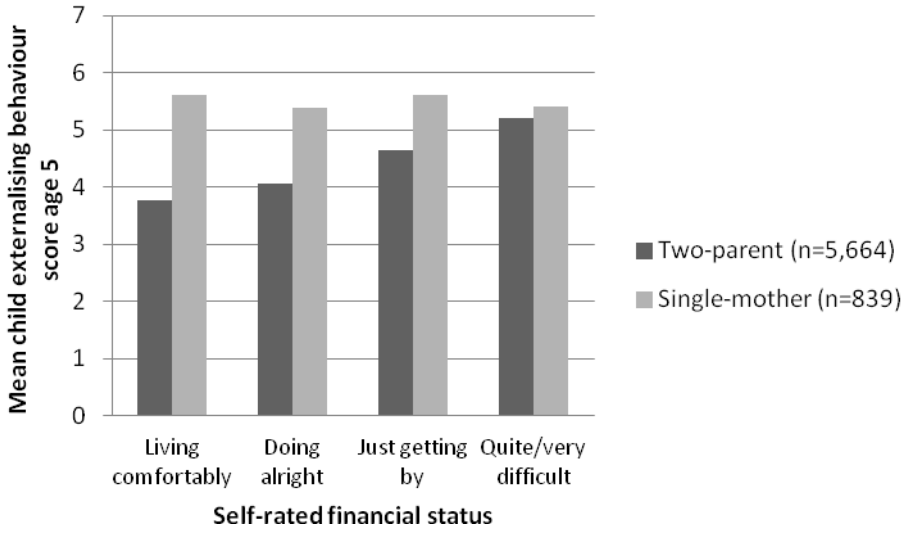


Figure 5.7 Mean child externalising behaviour score at five years in two-parent and single-mother families by maternal educational level at nine months

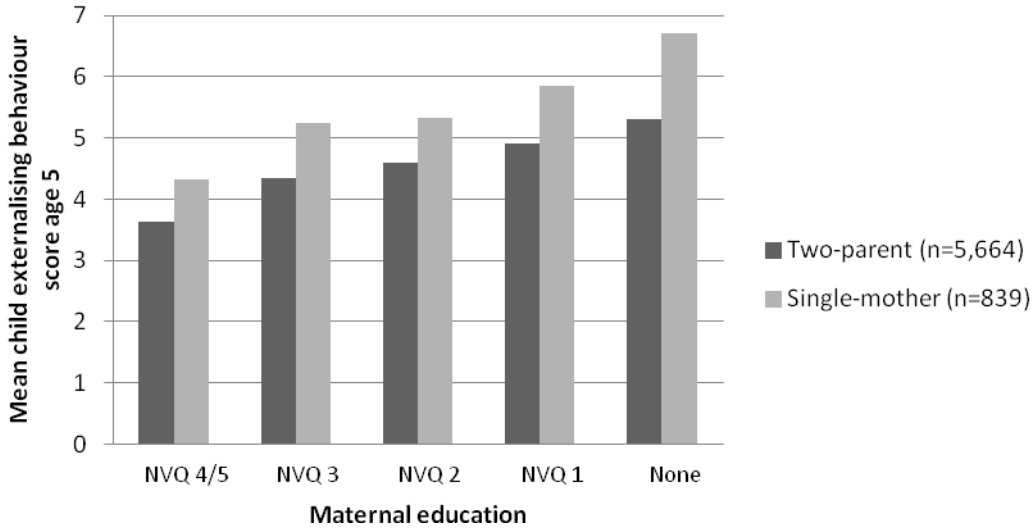
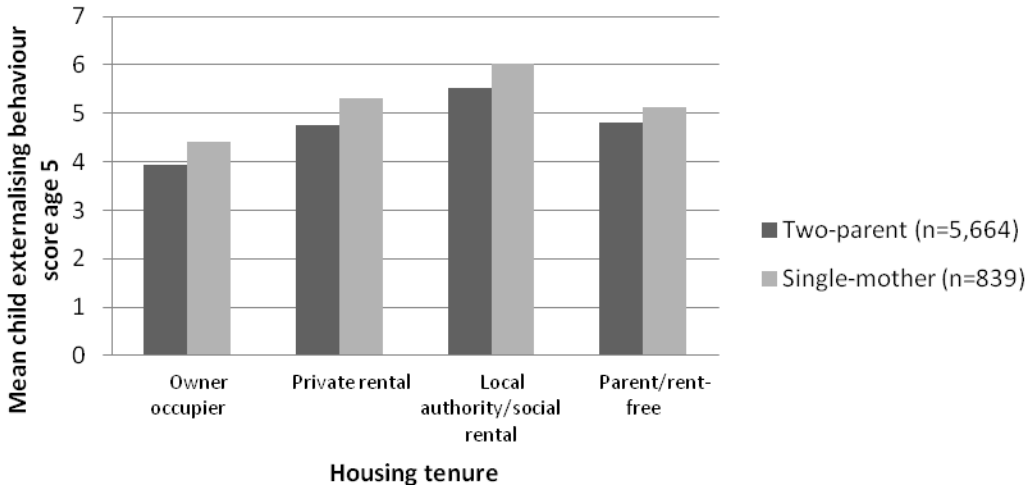


Figure 5.8 Mean child externalising behaviour score at five years in two-parent and single-mother families by housing tenure at nine months



In single-mother families, an inverse gradient association was found between child externalising behaviour score at five years, maternal education (Figure 5.7) and the first three categories of housing tenure (owner-occupier, private rental and social housing) (Figure 5.8). The pattern of distribution in the single-mother sample was less clear for the association between child externalising behaviour score at five years, family income (Figure 5.5) and self-rated financial status (Figure 5.6). As previously noted, this difference in the single-mother sample may be due to the lack of variation within the single-mother sample with respect to socio-economic position, along with the smaller sample size.

In order to test this association further, linear regression models were run of the association between each SEP indicator at nine months and child externalising behaviour at five years by gender and family structure, controlling for only the child and mother covariates. For the purposes of the regression analyses, some of the SEP variable categories were combined in order to increase the cell sizes and

ensure there were sufficient numbers in each category across each stratified sample (>50). The other/overseas qualifications category of maternal education could not conceptually be easily combined with any other category, and therefore it was left as a separate category, despite having fewer than 50 in the cell. In addition, equivalised family income tertiles were derived instead of quintiles, because so few single mothers were in the higher quintile categories of income. Within-sample tertiles were derived. Post-estimation tests were conducted on the adjusted linear regression models for homoscedasticity, independence of error terms, normal distribution of residuals and multicollinearity, and all the assumptions were met. The results are presented by gender in Table 5.3 and by family structure in Table 5.4.

For both boys and girls (Table 5.3), externalising behaviour score increased with decreasing income tertile at nine months. Living in a family below-60%-median-income at nine months compared with above it was also significantly associated with a higher externalising behaviour score at five years. Higher financial pressure, lower maternal educational level and living in local-authority or social housing at nine months were all associated with a significantly higher externalising behaviour score at five years in both boys and girls. Living in overcrowded conditions at nine months was not significantly associated with externalising behaviour at five years in boys or girls, although the small size of this group of families may have lacked sufficient power to test this association robustly.

Table 5.3 The association between socio-economic position (SEP) at nine months and externalising behaviour score at five years, by gender

SEP	Externalising behaviour at five years Boys Model 1		Girls Model 1	
	n	Coeff. (95% CI)	n	Coeff. (95% CI)
Equivalised family income tertile				
Highest	1,184	0.00	984	0.00
Middle	1,084	**0.44 (0.14, 0.75)**	1,084	**0.37 (0.06, 0.68)**
Lowest	1,033	**1.07 (0.61, 1.53)**	1,134	**0.68 (0.31, 1.05)**
Poverty				
Above-60%-median income	2,438	0.00	2,379	0.00
Below-60%-median income	863	**0.50 (0.05, 0.94)**	823	**0.70 (0.32, 1.07)**
Self-rated financial status				
Comfortable/alright	2,213	0.00	2,128	0.00
Just about getting by	811	**0.54 (0.18, 0.90)**	798	**0.61 (0.30, 0.92)**
Quite/very difficult	277	**0.90 (0.34, 1.46)**	276	**0.82 (0.36, 1.28)**
Maternal education				
NVQ level 3–5	1,857	0.00	1,759	0.00
NVQ level 2	950	**0.53 (0.26, 0.80)**	995	**0.63 (0.37, 0.89)**
NVQ level 1	225	**0.90 (0.33, 1.47)**	198	**0.64 (0.18, 1.11)**
Other/overseas	43	**1.58 (0.11, 3.06)**	30	**0.88 (0.06, 1.71)**
None	226	**1.27 (0.68, 1.86)**	220	**1.28 (0.73, 1.83)**
Housing tenure				
Owner/private rent	2,548	0.00	2,455	0.00
Local authority/social	585	**1.17 (0.71, 1.63)**	599	**1.10 (0.64, 1.55)**
Parents/rent free/other	168	0.08 (-0.62, 0.78)	148	0.31 (-0.35, 0.98)
Overcrowding				
No (≥1 room p/person)	3,116	0.00	3,006	0.00
Yes (< 1 room p/person)	185	0.47 (-0.26, 1.20)	196	-0.01 (-0.52, 0.49)

Bold text $p < .05$ for coefficient.
Model one adjusting for: family structure at nine months, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared) and birth order.

In the two-parent families (Table 5.4) the results were similar to those found in the boys' and girls' sample, with a significant association between a higher externalising behaviour score at five years and being in the lowest income tertile, living below-60%-median-income, having higher financial pressure, having a lower maternal educational level and living in local-authority or social housing at nine months.

Table 5.4 The association between SEP at nine months and externalising behaviour score at five years, by family structure

SEP	Externalising behaviour at five years Two parents Model 1		Single mothers Model 1	
	n	Coeff. (95% CI)	n	Coeff. (95% CI)
Equivalised family income tertile				
Highest	1,887	0.00	258	0.00
Middle	1,745	**0.36 (0.13, 0.58)**	277	-0.54 (-1.26, 0.18)
Lowest	2,032	**0.86 (0.58, 1.15)**	304	-0.45 (-1.24, 0.35)
Poverty				
Above-60%-median income	4,644	0.00	173	0.00
Below-60%-median income	1,020	**0.71 (0.39, 1.02)**	666	-0.22 (-0.95, 0.51)
Self-rated financial status				
Comfortable/alright	3,987	0.00	354	0.00
Just about getting by	1,284	**0.60 (0.36, 0.83)**	325	0.12 (-0.47, 0.71)
Quite/very difficult	393	**1.04 (0.65, 1.43)**	160	0.02 (-0.83, 0.87)
Maternal education				
NVQ level 3–5	3,373	0.00	243	0.00
NVQ level 2	1,631	**0.62 (0.43, 0.80)**	314	0.23 (-0.41, 0.87)
NVQ level 1	310	**0.81 (0.37, 1.24)**	113	0.59 (-0.35, 1.53)
Other/overseas	64	0.88 (-0.04, 1.79)	9	**3.70 (2.03, 5.36)**
None	286	**1.10 (0.63, 1.57)**	160	**1.48 (0.55, 2.41)**
Housing tenure				
Owner/private rent	4,761	0.00	242	0.00
Local authority/social	743	**1.15 (0.77, 1.53)**	441	0.65 (-0.08, 1.37)
Parents/rent-free/other	160	0.32 (-0.24, 0.88)	156	-0.08 (-0.95, 0.79)
Overcrowding				
No (≥1 room p/person)	5,342	0.00	780	0.00
Yes (< 1 room p/person)	322	0.36 (-0.12, 0.83)	59	-0.20 (-1.42, 1.02)

Bold text p < .05 for coefficient.
Model one adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared) and birth order.

In the single-mother families there was no evidence of an association between child externalising behaviour at five years and being in the lowest or middle income tertile (compared with the highest), living below-60%-median-income, having higher financial pressure, living in local-authority or social housing, or overcrowding at nine months. There was a significant association between having other/overseas qualifications or no qualifications at nine months (compared with the highest

qualifications) and a higher child externalising behaviour score at five years. Again, the smaller sample size and lack of variation in socio-economic position among the single mothers may explain the lack of significant association between socio-economic position at nine months and child externalising behaviour at five years in this sample.

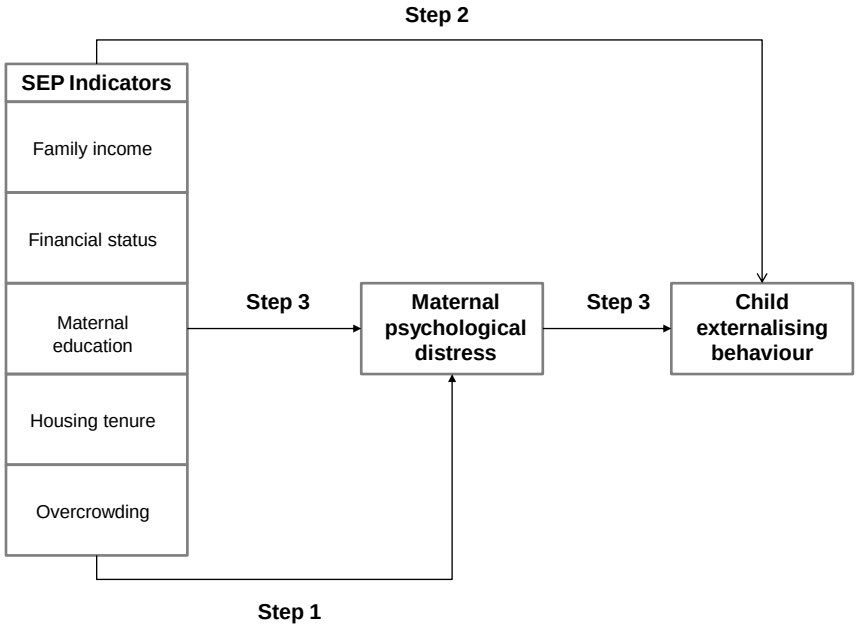
5.2.3 The mediating role of maternal psychological distress in the association between socio-economic position and child externalising behaviour

Hypothesis 2b: The relationship between early-life socio-economic position (nine months) and child externalising behaviour symptoms at five years operates through its effects on maternal psychological distress at nine months and three years. There will be no significant difference by gender, and a stronger effect for single-mother families compared with two-parent families.

In order to test hypothesis 2b, a three-step mediation analysis approach was used.[283] This approach consists of running three linear regression models, representing the three steps in the process. The first regression model tests the association between the exposure (SEP) and the proposed mediator (maternal psychological distress at nine months and three years). The second model tests the association between the exposure (SEP) and the outcome (child externalising behaviour at five years). The final model tests the effect of adding the proposed mediator (maternal psychological distress) to the step-two model of the association between the exposure (SEP) and the outcome (child externalising behaviour at five years). Three criteria must hold for mediation to be confirmed. Firstly, in step one, the exposure (SEP) must be shown to have an association with the mediator (maternal psychological distress). Secondly, there must be an association between

the exposure (SEP) and outcome (child externalising behaviour at five years). Thirdly, the addition of the proposed mediator (maternal psychological distress) to the second model must attenuate the association between the exposure (SEP) and the outcome (child externalising behaviour). The extent of mediation is assessed by the degree to which the association between the exposure (SEP) and the outcome (child externalising behaviour) is attenuated in the third model. If maternal psychological distress were a perfect mediator, the association between SEP and child externalising behaviour would be completely attenuated after the addition of maternal psychological distress to the step-two model. Figure 5.9 illustrates the mediation model for the mediating effect of maternal psychological distress at nine months and three years in the association between SEP at nine months and child externalising behaviour at five years.

Figure 5.9 The mediation model for maternal psychological distress at nine months and three years in the association between socio-economic position at nine months and child externalising behaviour at five years



The combined effects (mutually adjusted) of the SEP indicators at nine months on child externalising behaviour at five years were tested. The combined category versions of the SEP indicators were used in the mediation regression analysis to ensure adequate cell sizes for each category across the stratified samples. The 60%-below-median income variable was excluded, as it is highly correlated with the family income variable, being derived from the same scale. Post-estimation tests were run on the fully adjusted linear regression models for homoscedasticity, independence of error terms, normal distribution of residuals and multicollinearity, and all of the assumptions were met.

The results of the step-one mediation regression analysis are presented in Table 5.5 by gender and Table 5.6 by family structure. The regression models are adjusted for the child and mother covariates, and mutually adjusted for all of the SEP measures excluding 60%-below-median income. A significant association was found between being in the middle or lowest income tertile at nine months and increased maternal psychological distress at three years in girls' families (Table 5.5) and two-parent families (Table 5.6), but not for boys. In the single-mother families (Table 5.6), being in the lowest income tertile compared with the highest at nine months was associated with decreased maternal psychological distress at nine months. Across all of the stratified samples 'just about getting by', and finding it 'quite difficult' or 'very difficult' to manage financially, compared with being 'comfortable' or 'alright', was associated with an increased maternal psychological distress score at nine months and three years. Living in local-authority or social rental housing at nine months was significantly associated with maternal psychological distress at nine months and three years in boys and girls and two-parent families, and with maternal psychological distress at three years in the single-mother families.

Table 5.5 Step one mediation: the association between SEP and maternal psychological distress, by gender

SEP at 9 months	BOYS Maternal psychological distress* 9 months		BOYS Maternal psychological distress* 3 years	GIRLS Maternal psychological distress* 9 months		GIRLS Maternal psychological distress* 3 years
	n	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)
Equivalised family income tertile						
Highest	1,184	0.00	0.00	984	0.00	0.00
Middle	1,084	0.09 (-0.06, 0.24)	0.17 (-0.12, 0.46)	1,084	0.01 (-0.15, 0.17)	**0.32 (0.04, 0.60)**
Lowest	1,033	0.00 (-0.21, 0.21)	0.19 (-0.19, 0.56)	1,134	-0.16 (-0.36, 0.05)	**0.42 (0.02, 0.82)**
Self-rated financial status						
Comfortable/alright	2,213	0.00	0.00	2,128	0.00	0.00
Just about getting by	811	**0.59 (0.40, 0.77)**	**0.99 (0.62, 1.35)**	798	**0.45 (0.30, 0.60)**	**0.79 (0.48, 1.11)**
Finding it quite/very difficult	277	**0.70 (0.48, 0.93)**	**1.57 (0.98, 2.16)**	276	**1.12 (0.86, 1.37)**	**2.20 (1.64, 2.76)**
Maternal education						
NVQ level 3–5	1,857	0.00	0.00	1,759	0.00	0.00
NVQ level 2	950	-0.08 (-0.24, 0.08)	-0.08 (-0.41, 0.26)	995	0.08 (-0.05, 0.20)	-0.03 (-0.30, 0.24)
NVQ level 1	225	0.01 (-0.25, 0.26)	0.20 (-0.39, 0.79)	198	0.15 (-0.15, 0.45)	0.08 (-0.54, 0.71)
Other/overseas	43	0.17 (-0.58, 0.92)	0.72 (-1.06, 2.49)	30	0.56 (-0.32, 1.44)	-0.03 (-1.27, 1.20)
None	226	0.24 (-0.15, 0.63)	0.23 (-0.54, 0.99)	220	-0.14 (-0.42, 0.13)	0.64 (-0.16, 1.44)
Housing tenure						
Owner/private rent	2,548	0.00	0.00	2,455	0.00	0.00
Local authority/social rental	585	**0.30 (0.01, 0.59)**	**0.71 (0.11, 1.30)**	599	**0.33 (0.10, 0.57)**	**0.62 (0.02, 1.22)**
Parents/rent-free/other	168	**0.53 (0.13, 0.92)**	-0.31 (-1.00, 0.37)	148	0.15 (-0.23, 0.53)	-0.09 (-0.74, 0.56)
Overcrowding						
No (≥1 room p/person)	3,116	0.00	0.00	3,006	0.00	0.00
Yes (< 1 room p/person)	185	0.32 (-0.08, 0.72)	0.57 (-0.18, 1.33)	196	0.13 (-0.21, 0.46)	0.20 (-0.58, 0.97)

Bold text $p < .05$ for coefficient.

*Adjusting for: family structure at nine months or three years, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.

Table 5.6 Step one mediation: the association between SEP and maternal psychological distress, by family structure

SEP at 9 months	TWO PARENTS Maternal psychological distress* 9 months		TWO PARENTS Maternal psychological distress* 3 years	SINGLE MOTHER Maternal psychological distress* 9 months		SINGLE MOTHER Maternal psychological distress* 3 years
	n	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)
Equivalised family income tertile						
Highest	1,887	0.00	0.00	258	0.00	0.00
Middle	1,745	0.02 (-0.10, 0.14)	**0.23 (0.00, 0.46)**	277	-0.44 (-0.86, 0.01)	-0.35 (-1.29, 0.59)
Lowest	2,032	-0.03 (-0.17, 0.11)	**0.33 (0.03, 0.63)**	304	**-0.51 (-0.94, -0.07)**	-0.38 (-1.27, 0.51)
Self-rated financial status						
Comfortable/alright	3,987	0.00	0.00	354	0.00	0.00
Just about getting by	1,284	**0.53 (0.40, 0.65)**	**0.90 (0.64, 1.15)**	325	**0.49 (0.17, 0.80)**	**1.01 (0.33, 1.67)**
Finding it quite/very difficult	393	**0.83 (0.65, 1.01)**	**1.95 (1.45, 2.45)**	160	**1.22 (0.80, 1.65)**	**1.94 (1.05, 2.84)**
Maternal education						
NVQ level 3–5	3,373	0.00	0.00	243	0.00	0.00
NVQ level 2	1,631	-0.01 (-0.12, 0.11)	-0.03 (-0.26, 0.21)	314	0.06 (-0.30, 0.42)	-0.40 (-1.17, 0.38)
NVQ level 1	310	0.10 (-0.11, 0.32)	0.05 (-0.40, 0.49)	113	0.01 (-0.45, 0.46)	-0.14 (-1.23, 0.95)
Other/overseas	64	0.15 (-0.50, 0.80)	-0.01 (-1.10, 1.09)	9	**1.48 (0.02, 2.94)**	3.49 (-1.35, 8.32)
None	286	0.16 (-0.12, 0.44)	0.60 (-0.04, 1.24)	160	-0.11 (-0.58, 0.35)	0.05 (-1.15, 1.25)
Housing tenure						
Owner/private rent	4,761	0.00	0.00	242	0.00	0.00
Local authority/social rental	743	**0.31 (0.11, 0.51)**	**0.65 (0.09, 1.20)**	441	0.25 (-0.14, 0.49)	**1.11 (0.27, 1.95)**
Parents/rent-free/other	160	**0.37 (0.04, 0.70)**	0.26 (-0.35, 0.86)	156	0.23 (-0.29, 0.75)	-0.39 (-1.36, 0.59)
Overcrowding						
No (≥1 room p/person)	5,342	0.00	0.00	780	0.00	0.00
Yes (< 1 room p/person)	322	0.16 (-0.11, 0.43)	0.27 (-0.31, 0.85)	59	0.68 (-0.15, 1.50)	-0.12 (-1.53, 1.30)

Bold text p < .05 for coefficient.

*Adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.

The first mediation criterion, of an association between SEP (the exposure) and maternal psychological distress at nine months and three years (the mediator), was met for equivalised family income in girls and two-parent families, and for self-rated financial status and living in local-authority or social housing across all of the samples. Maternal educational level and overcrowding were not significantly associated with maternal psychological distress at nine months or three years, and therefore did not meet the mediation criteria.

Step two of the mediation analysis was to test the association between SEP at nine months (the exposures) and child externalising behaviour at five years (the outcome). The results are presented by gender (Table 5.7) and family structure (Table 5.8). A significant positive association was found between being in the lowest income tertile (compared with the highest) at nine months and externalising behaviour at five years in boys and two-parent families. In single-mother families, being in the lowest- or middle-income tertile (compared with the highest) was associated with a lower child externalising behaviour score at five years. Finding it ‘quite difficult’ or ‘very difficult’ to manage financially (compared with being ‘comfortable’ and ‘doing aright’) and living in local-authority or social housing, (compared with ‘owning your own home’) were associated with an increased externalising behaviour score at five years in boys and girls, and with two-parent families but not single-mother families. Lower maternal educational qualifications at nine months were also associated with increased child externalising behaviour scores at five years across all of the samples. Overcrowding at nine months was not significantly associated with child externalising behaviour at five years in any of the stratified samples.

Following step two of the mediation analysis, the SEP measures which met both criteria one and two of mediation were equivalised family income in the two-parent and single-mother families, self-rated financial status and housing tenure for boys and girls, and two-parent families.

The final step in the mediation analysis was to test the effect of adding the proposed mediator, maternal psychological distress at nine months and three years, to the model of the association between SEP and child externalising behaviour score at five years. The results are shown in Table 5.7 by gender and Table 5.8 by family structure and the SEP measures which met both criteria one and two of mediation are highlighted by grey shading. With the SEP measures which met criteria one and two of mediation in the girls and boys (Table 5.7), the addition of maternal psychological distress at nine months and three years attenuated the association between finding it 'quite difficult' or 'very difficult' at nine months and externalising behaviour at five years to the degree that it was no longer significantly associated. The association between living in local-authority or social rental accommodation and boys' and girls' externalising behaviour at five years was only slightly attenuated, and the association remained significant. In the two-parent families (Table 5.8), the addition of maternal psychological distress at nine months and three years attenuated the association between 'just about getting by' and finding it 'quite difficult' or 'very difficult' to manage financially at nine months and externalising behaviour at five years to a substantial degree, but the associations remained largely significant. The association between being in the lowest income tertile (compared with the highest) and living in local-authority or social housing (compared with owner-occupier) and child externalising behaviour at five years was only slightly attenuated and remained significant.

Table 5.7 Step two and three mediation: the role of maternal psychological distress in the association between SEP and externalising behaviour, by gender

SEP at 9 months	BOYS				GIRLS			
		Externalising behaviour at 5 years[1]	+ Maternal psychological distress at 9 months[2]	+ Maternal psychological distress at 3 years[3]		Externalising behaviour at 5 years[1]	+ Maternal psychological distress at 9 months[2]	+ Maternal psychological distress at 3 years[3]
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
Equivalised income tertile								
Highest	1,184	0.00	0.00	0.00	984	0.00	0.00	0.00
Middle	1,084	0.26 (-0.04, 0.56)	0.23 (-0.08, 0.53)	0.23 (-0.07, 0.53)	1,084	0.15 (-0.16, 0.46)	0.15 (-0.15, 0.45)	0.09 (-0.20, 0.39)
Lowest	1,033	**0.55 (0.11, 1.00)**	**0.55 (0.13, 0.98)**	**0.50 (0.08, 0.91)**	1,134	0.05 (-0.36, 0.46)	0.10 (-0.31, 0.50)	-0.00 (-0.40, 0.39)
Self-rated financial status								
Comfortable/alright	2,213	0.00	0.00	0.00	2,128	0.00	0.00	0.00
Just about getting by	811	0.30 (-0.03, 0.64)	0.05 (-0.28, 0.38)	0.08 (-0.24, 0.41)	798	**0.45 (0.11, 0.78)**	0.31 (-0.02, 0.63)	0.29 (-0.03, 0.62)
Finding it quite/very difficult	277	**0.61 (0.05, 1.16)**	0.30 (-0.25, 0.85)	0.24 (-0.29, 0.77)	276	**0.71 (0.24, 1.19)**	0.36 (-0.12, 0.84)	0.30 (-0.16, 0.76)
Maternal education								
NVQ level 3–5	1,857	0.00	0.00	0.00	1,759	0.00	0.00	0.00
NVQ level 2	950	**0.40 (0.13, 0.67)**	**0.43 (0.17, 0.70)**	**0.41 (0.14, 0.69)**	995	**0.53 (0.27, 0.80)**	**0.51 (0.25, 0.77)**	**0.54 (0.28, 0.80)**
NVQ level 1	225	**0.64 (0.08, 1.20)**	**0.64 (0.08, 1.19)**	**0.59 (0.03, 1.14)**	198	0.46 (-0.04, 0.95)	0.41 (-0.07, 0.89)	0.46 (-0.02, 0.94)
Other/overseas	43	1.16 (-0.38, 2.70)	1.09 (-0.33, 2.51)	1.00 (-0.40, 2.40)	30	0.65 (-0.10, 1.41)	0.48 (-0.27, 1.22)	0.64 (-0.06, 1.34)
None	226	**0.84 (0.22, 1.46)**	**0.74 (0.13, 1.34)**	**0.78 (0.15, 1.41)**	220	**1.04 (0.49, 1.59)**	**1.08 (0.53, 1.63)**	**0.92 (0.38, 1.47)**
Housing tenure								
Owner/private rent	2,548	0.00	0.00	0.00	2,455	0.00	0.00	0.00
Local authority/social rental	585	**0.77 (0.29, 1.26)**	**0.64 (0.17, 1.11)**	**0.59 (0.14, 1.04)**	599	**0.88 (0.43, 1.34)**	**0.78 (0.32, 1.23)**	**0.77 (0.36, 1.17)**
Parents/rent-free/other	168	-0.12 (-0.82, 0.58)	-0.35 (-1.01, 0.31)	-0.09 (-0.73, 0.55)	148	0.44 (-0.24, 1.12)	0.39 (-0.26, 1.04)	0.49 (-0.14, 1.11)
Overcrowding								
No (≥1 room p/person)	3,116	0.00	0.00	0.00	3,006	0.00	0.00	0.00
Yes (< 1 room p/person)	185	0.23 (-0.49, 0.96)	0.09 (-0.59, 0.78)	-0.09 (-0.59, 0.82)	196	-0.39 (-0.90, 0.12)	-0.43 (-0.93, 0.07)	-0.47 (-0.96, 0.02)

Bold text p < .05 for coefficient.

Grey shading – mediation criteria one and two met.

1 Adjusting for: family structure at nine months, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.

2 As 1, additionally adjusting for maternal psychological distress at nine months.

3 As 1, additionally adjusting for maternal psychological distress at three years.

Table 5.8 Step two and three mediation: the role of maternal psychological distress in the association between SEP and externalising behaviour, by family structure

SEP at 9 months	TWO PARENTS				SINGLE MOTHER			
		Externalising behaviour at 5 years[1]	+ Maternal psychological distress at 9 months[2]	+ Maternal psychological distress at 3 years[3]		Externalising behaviour at 5 years[1]	+ Maternal psychological distress at 9 months[2]	+ Maternal psychological distress at 3 years[3]
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
Equivalised income tertile								
Highest	1,887	0.00	0.00	0.00	258	0.00	0.00	0.00
Middle	1,745	0.20 (-0.02, 0.42)	0.19 (-0.02, 0.40)	0.18 (-0.04, 0.39)	277	**-0.94 (-1.76, -0.13)**	-0.80 (-1.59, 0.00)	**-0.89 (-1.68, -0.10)**
Lowest	2,032	**0.34 (0.05, 0.64)**	**0.36 (0.07, 0.64)**	**0.28 (-0.00, 0.57)**	304	**-0.87 (-1.69, -0.04)**	-0.67 (-1.48, 0.14)	-0.78 (-1.58, 0.02)
Self-rated financial status								
Comfortable/alright	3,987	0.00	0.00	0.00	354	0.00	0.00	0.00
Just about getting by	1,284	**0.39 (0.16, 0.62)**	0.20 (-0.03, 0.42)	**0.23 (-0.01, 0.46)**	325	0.03 (-0.57, 0.62)	-0.16 (-0.76, 0.44)	-0.19 (-0.77, 0.39)
Finding it quite/very difficult	393	**0.82 (0.42, 1.22)**	**0.51 (0.11, 0.91)**	**0.62 (0.20, 1.03)**	160	-0.06 (-0.89, 0.77)	-0.52 (-1.39, 0.35)	-0.47 (-1.27, 0.33)
Maternal education								
NVQ level 3–5	3,373	0.00	0.00	0.00	243	0.00	0.00	0.00
NVQ level 2	1,631	**0.50 (0.32,0.68)**	**0.50 (0.32, 0.68)**	**0.49 (0.30, 0.68)**	314	0.23 (-0.46, 0.91)	0.20 (-0.47, 0.88)	0.31 (-0.36, 0.98)
NVQ level 1	310	**0.55 (0.11, 0.99)**	**0.51 (0.09, 0.93)**	**0.44 (0.00, 0.87)**	113	0.68 (-0.28, 1.64)	0.68 (-0.28, 1.64)	0.71 (-0.14, 1.56)
Other/overseas	64	0.58 (-0.34, 1.51)	0.53 (-0.36, 1.41)	0.58 (-0.34, 1.50)	9	**3.99 (1.99, 6.00)**	**3.45 (1.50, 5.40)**	**3.27 (1.51, 5.02)**
None	286	**0.71 (0.25, 1.18)**	**0.65 (0.18, 1.13)**	**0.52 (0.00, 1.03)**	160	**1.59 (0.62, 2.57)**	**1.64 (0.69, 2.59)**	**1.58 (0.62, 2.55)**
Housing tenure								
Owner/private rent	4,761	0.00	0.00	0.00	242	0.00	0.00	0.00
Local authority/social rental	743	**0.82 (0.43, 1.20)**	**0.71 (0.33, 1.08)**	**0.70 (0.33, 1.07)**	441	0.73 (-0.01, 1.46)	0.63 (-0.10, 1.36)	0.49 (-0.21, 1.19)
Parents/rent-free/other	160	0.24 (-0.32, 0.80)	0.11 (-0.42, 0.64)	0.06 (-0.51, 0.62)	156	0.02 (-0.86, 0.89)	-0.07 (-0.92, 0.78)	0.10 (-0.73, 0.93)
Overcrowding								
No (≥1 room p/person)	5,342	0.00	0.00	0.00	780	0.00	0.00	0.00
Yes (< 1 room p/person)	322	-0.04 (-0.49, 0.42)	-0.10 (-0.53, 0.34)	-0.14 (-0.58, 0.30)	59	-0.21 (-1.41, 0.99)	-0.47 (-1.67, 0.73)	-0.19 (-1.32, 0.96)

Bold text p < .05 for coefficient.

Grey shading – mediation criteria one and two met.

1 Adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.

2 As 1, additionally adjusting for maternal psychological distress at nine months.

3 As 1, additionally adjusting for maternal psychological distress at three years.

In the single-mother families (Table 5.8) the association between middle and low income at nine months and decreased externalising behaviour score at five years was largely attenuated by the addition of maternal psychological distress at nine months, and to a lesser extent by the addition of maternal psychological distress at three years to the model.

The mediation analyses found the strongest evidence of a mediating effect of maternal psychological distress at nine months, and to a lesser degree at three years, in the association between self-rated financial status, or finding it difficult to manage financially and child externalising behaviour at five years in boys and girls and two-parent families. This is consistent with the FSM evidence that has found that self-reported financial pressure is a key driver of psychological distress which subsequently impacts on child behaviour.[133;141;289] There was little evidence that housing tenure at nine months – specifically, living in local-authority or social rental housing – influenced child externalising behaviour at five years through its effects on maternal psychological distress. However, housing tenure was independently associated with child externalising behaviour at five years in boys and girls and two-parent families.

5.2.4 The moderating role of socio-economic position

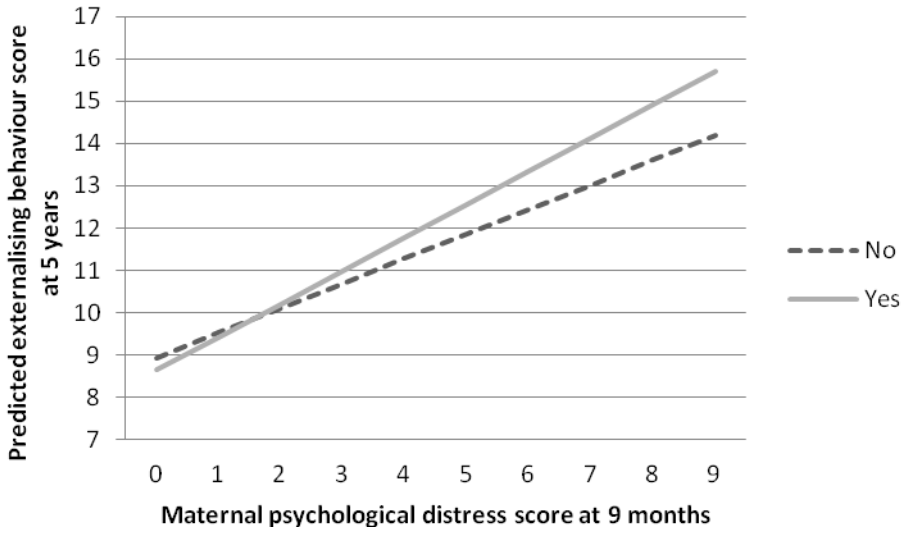
Hypothesis 2c: The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years is stronger within the context of disadvantage. There will be a stronger effect for boys compared with girls, and a stronger effect for single-mother compared with two-parent families.

In order to test hypothesis 2c, two-way interaction terms of maternal psychological distress multiplied by each SEP indicator were introduced into the linear regression models of the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years, adjusting for the covariates and SEP indicators. In addition to the five SEP indicators of equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding, the poverty measure was used in this analysis, defined as 60%-below-median income. The poverty indicator was included because evidence has shown that the family stress pathway from SEP to maternal psychological distress and child externalising behaviour may better explain the effect of SEP on maternal psychological distress and consequent child behavioural outcomes in families living below the relative poverty threshold.[130] After running each regression model with the relevant interaction term, a post-estimation test of significance (Wald test) was conducted. A significant Wald test ($p \leq 0.05$) was deemed evidence of effect modification. In the regression models to test effect modification by poverty, the equivalised family income variable was excluded from the model and vice versa, as these measures were highly correlated, being derived from the same income scale. Where evidence of effect modification was found, the predicted regression line of the association between maternal psychological distress and child externalising behaviour by the moderator was plotted to facilitate examination of the effect. After all of the models had been run, evidence of an interaction was only found for the poverty indicator in the association between maternal psychological distress at nine months and child externalising behaviour at five years in boys ($p=0.023$) and two-parent families ($p=0.005$).

The predicted association between maternal psychological distress at nine months and externalising behaviour at five years by poverty was plotted for the boys and

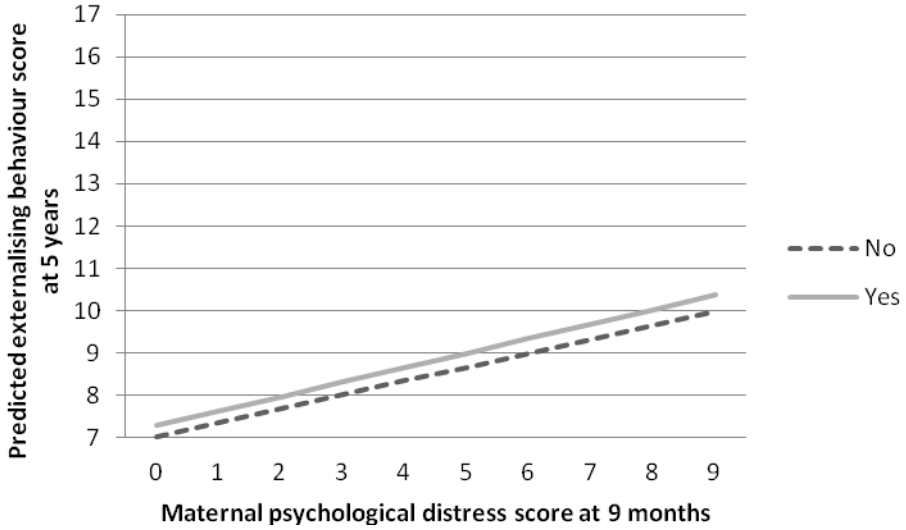
girls, and for two-parent and single-mother families. The girls' and single-mother graphs were plotted for comparison only. In boys the predicted regression line for the association between maternal psychological distress at nine months and boys' externalising behaviour at five years was significantly steeper in families below the poverty line (Yes) compared with those above it (No) (Figure 5.10), indicating a stronger association amongst families living in poverty.

Figure 5.10 The relationship between maternal psychological distress at nine months and externalising behaviour score at five years in boys (n=3,301), by poverty



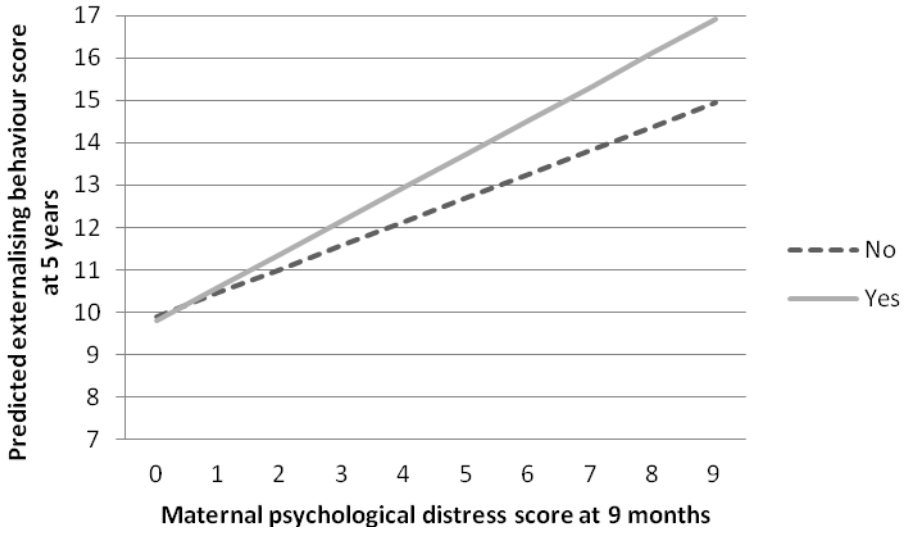
For comparison, the predicted regression lines for the association between maternal psychological distress at nine months and externalising behaviour at five years in the girls by poverty were plotted (Figure 5.11). Here the predicted regression lines for girls above and below the poverty line were parallel, indicating no difference in the association between maternal psychological distress at nine months and girls' externalising behaviour at five years by poverty group.

Figure 5.11 The relationship between maternal psychological distress at nine months and externalising behaviour score at five years in girls (n=3,202), by poverty



In two-parent families where a significant interaction by poverty was found, the association between maternal psychological distress at nine months and child externalising behaviour at five years was stronger in families below the poverty line (Yes) compared with those above the poverty line (No), as indicated by the steeper regression line (Figure 5.12).

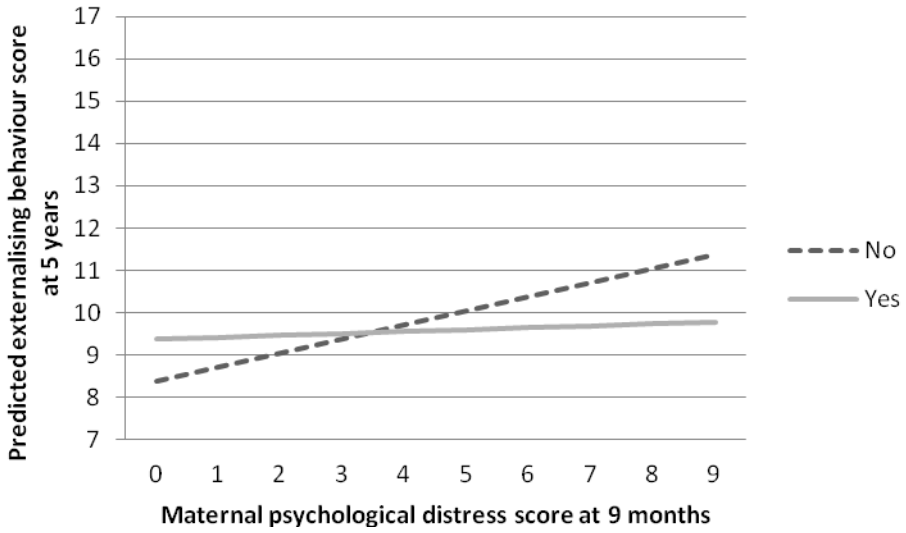
Figure 5.12 The relationship between maternal psychological distress at nine months and child externalising behaviour score at five years in two-parent families (n=5,664), by poverty



Lastly, the association between maternal psychological distress at nine months and child externalising behaviour at five years was plotted for the single mothers as a comparison, as no evidence of an interaction by poverty had been found for this group (Figure 5.13). The association between maternal psychological distress at nine months and child externalising behaviour at five years in single-mother families below the poverty line (Yes) appeared weaker than in those above the poverty line (No). There was no evidence of an interaction by poverty in single mothers, although the predicted regression lines plotted appear to indicate there may be an interaction, albeit not in the hypothesised direction.

These results support hypothesis 3c in the boys' sample and two-parent family sample: the relationship between maternal psychological distress at nine months and child externalising behaviour at five years is stronger within the context of disadvantage.

Figure 5.13 The relationship between externalising behaviour score at five years and maternal psychological distress at nine months in single-mother families (n=839), by poverty



No evidence of effect modification was found for any of the other SEP indicators, although this does not preclude an interaction, as it is possible that there was insufficient power in the gradient SEP measures to detect such effects. Alternatively, it may be a chance finding of the significant interaction by poverty in the relationship between maternal psychological distress at nine months and child externalising behaviour at five years for boys and two-parent families.

5.3 Main findings and discussion

This chapter aimed to explore gender and family structure differences in the role of early SEP in the longitudinal association between maternal psychological distress and child externalising behaviour. As expected, boys' and girls' families lived in comparable socio-economic circumstances, while single-mother families were considerably socio-economically disadvantaged compared to two-parent families. This result is consistent with research that has shown that single-mothers are more

likely to be socio-economically disadvantaged than two-parent families.[133;142] Evidence was found of an association between a number of markers of early-life SEP and child externalising behaviour at five years in boys and girls and two-parent and single-mother families, so that as SEP lowered, externalising behaviour symptoms at five years increased. In the sample of boys, girls and two-parent families, all of the gradient SEP indicators were found to have an significant inverse association with child externalising behaviour at five years: family income quintiles, self-rated financial status, maternal education and housing tenure. This result adds to the growing body of research which has found a social gradient in child health and development.[134-138]

For single-mother families there was a lack of statistical evidence of any association between almost all of the SEP indicators and child externalising behaviour at five years, with the exception of maternal education – specifically with having other/overseas qualifications or no qualifications compared with NVQ 3–5 qualifications. The lack of association between SEP and child externalising behaviour in the single-mother families was unexpected in light of the evidence which suggests that poorer child outcomes in single-mother families can be largely accounted for by socio-economic position.[133;141] Two methodological explanations for this lack of statistical association in the single-mother sample are proposed. Firstly, the relatively small sample of single mothers may have lacked sufficient power to detect a statistically significant association. Secondly, due to the concentration of single-mother families in socio-economic disadvantage, the sample may have lacked sufficient internal variation between categories to detect significant differences.

The mediation analyses found evidence that self-rated financial status operated to the largest extent through its effects on maternal psychological distress at nine months and three years to influence externalising behaviour at five years in boys, girls and two-parent families. In the mutually adjusted regression models, family income tertiles at nine months did not have an independent association with child externalising behaviour and were completely attenuated by the addition of the other SEP indicators. It is proposed that this is because family income effects operate through self-rated financial status to influence child externalising behaviour, and this is supported in the literature.[119-121] This result may have implications for future research, as self-rated financial status may be a more sensitive indicator of the effect of SEP on maternal psychological distress and consequently on child externalising behaviour. However, there is also the possibility of reverse causation, as maternal psychological distress may influence self-rated financial status because distressed mothers may view their circumstances more negatively. Among the single mothers the only SEP measure significantly associated with child externalising behaviour was family income, albeit not in the expected direction. However, after controlling for maternal psychological distress this association was completely attenuated and became non-significant.

Maternal educational level and housing tenure at nine months were found to have a significant independent association with child externalising behaviour at five years in the boys, girls and two-parent families, and this did not operate through maternal psychological distress. This suggests that other pathways than that proposed by the FSM are operating from these SEP indicators to influence child externalising behaviour. One explanation is that maternal educational levels may influence child behavioural outcomes via pathways associated with social status and employment, such as the social capital that education provides, although this was not tested in

the study. These pathways are likely to be complex. For example, maternal educational level is associated with a later age at marriage and at childbirth. This may in turn influence child behavioural outcomes through the quality of the father-mother relationship, which has also been found to impact directly on child behaviour, as well as through maternal psychological distress.[127;128] The independent effect of housing tenure on child externalising behaviour is consistent with research that has found housing tenure to be associated with child outcomes through the wider contextual environment such as the quality of the home and neighbourhood environment. [290] For example, living in local-authority or social housing may involve living in less child-friendly housing such as high-rise flats, or in poorer, less safe neighbourhoods, which may impact on child externalising behaviour through a lack of outdoor play environments.

Lastly, the thesis found some evidence that the relationship between maternal psychological distress at nine months and child externalising behaviour at five years was stronger within the context of poverty, although only in the sample of boys and two-parent families. This is consistent with research that has found the FSM to better explain the association between maternal psychological distress and child externalising behaviour in the context of poverty.[130] It is possible that an environment of poverty and all of the stress this might entail, particularly for the mother and father and family relationships, may affect boys differently to girls.[132] This would be consistent with evidence that has shown that boys and girls are affected differently by different stressors, such as maternal coercion and non-affection, and this may be the case in poverty.[169] The modifying effect of poverty found in the two-parent families may have been driven by this in the boys' sample.

Chapter 6: The role of parenting, mother-father relationship quality and emotional support in the association between maternal psychological distress and child externalising behaviour

6.1 Introduction

Objective 3: To investigate the role of maternal parenting, father-child relationship quality, emotional support and mother-father relationship quality in the association between maternal psychological distress symptoms in early life and child externalising behaviour symptoms at five years, examining potential differences by gender and family structure.

The family stress model (FSM) portrays a pathway triggered by socio-economic disadvantage that affects maternal psychological distress and consequently influences child behavioural outcomes.[119] The FSM also proposes that maternal psychological distress might operate to influence child behaviour through parenting behaviours, with parenting behaviours additionally being influenced by the quality of the mother-father relationship. Increased maternal psychological distress is proposed to operate through parenting to impact on child behaviour by increasing harsh parenting and decreasing warm parenting.[119-121] In addition, there is evidence that maternal psychological distress impacts on the quality of the mother-child relationship,[15;16;143] which has been found to have the strongest association with child behavioural problems when compared with other parenting dimensions.[70] There is also evidence that the mother-child relationship may be of more importance, and have a greater effect on child behavioural outcomes, in single-mother families than in two-parent families.[143] In addition, evidence suggests differential effects of parenting by the gender of the child.[169] Gender differences have been found in adolescent externalising behaviour by parent

responsiveness,[32;159] the child-parent relationship[164;165] and parental hostility.[165;166] This evidence specifically informs the first three hypotheses to be tested in this chapter, which state:

3a Maternal psychological distress symptoms at nine months and three years, and child externalising behaviour symptoms at five years, are associated with maternal harsh discipline, low warmth and a lower-quality mother-child relationship at three years. There will be no differences by gender or family structure.

3b The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years operates through parenting behaviour at three years. There will be no differences by gender or family structure.

3c The mother-child relationship quality is the strongest parenting mediator in the association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years. There will be no differences by gender, and a stronger association in single-mother families compared with two-parent families.

Studies which have investigated the family stress model in single-mother families have proposed that emotional support may play an important role. How emotional support operates in the association between maternal psychological distress and child externalising behaviour is not clear. Emotional support has been shown to buffer the effect of economic pressure on increased punitive parenting in Finnish

mothers,[291] although whether this operates through maternal psychological distress is not known. In addition, the buffering effect of emotional support has been found to occur equally in two-parent and single-parent families.[291] Emotional support may also enhance parental psychological well-being and consequently parenting,[78] and a link between emotional support and maternal mental health has been shown.[292;293] In particular, a lack of emotional support during a crisis can predict the onset of depression, while having good emotional support can be protective against depression. In this study, emotional support is hypothesised as a potential moderator of the relationship between maternal psychological distress and child externalising behaviour. This is examined in families of boys and girls and single-mother and two-parent families.

3d The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years is stronger in the context of low emotional support (moderator). There are no differences by gender or family structure.

More recent research has examined the effects of paternal parenting in the relationship between maternal psychological distress and child externalising behaviour. Researchers have found that less responsive, less sensitive fathering at three months is associated with increased externalising behaviour problems in later childhood (aged eight and 11 years).[174] In addition, there is some evidence of same-sex effects in parenting. For example, in a pre- and post-treatment assessment of children diagnosed with conduct problems, the only gender-specific risk factor for externalising behaviour found was father negativity, which was associated with boys' behaviour at home, but not girls'.[166] Research which has tested for a potential

moderating effect by the father-child relationship on child externalising behaviour outcomes, controlling for maternal depression, has found that the quality of the father-child relationship does not appear to buffer the effect of maternal depression on child externalising behaviour.[172] The hypothesis to be tested in this study states that:

3e Among two-parent families, the relationship between maternal psychological distress symptoms in the early years and externalising behaviour symptoms in boys and girls at five years is stronger in the context of a poor father-child relationship at three years compared with a fair or good father-child relationship.

In two-parent families, increased mother-father relationship conflict is hypothesised as playing a role in the pathway from socio-economic hardship to maternal psychological distress, and additionally as impacting on parenting and subsequent child behavioural outcomes.[116] Mother-father relationship quality has also been found to be associated with maternal psychological distress.[152;153] There is evidence that a warm relationship between the mother and father can attenuate the relationship between maternal post-natal depression and infant distress, and that conversely, marital conflict can exacerbated this relationship.[154] In this thesis mother-father relationship quality is hypothesised as operating to moderate the relationship been maternal psychological distress and child externalising behaviour, as follows:

3f Among two-parent families, the relationship between maternal psychological distress symptoms in the early years and externalising behaviour symptoms in boys and girls at five years is stronger in the context of a poor mother-father relationship quality at three years compared with a fair or good mother-father relationship.

6.2 Results

6.2.1 The distribution of the parenting measures

Along with the parenting measures used in this thesis and described in the methods chapter, the covariates identified a priori as important at this stage of the analysis were post-natal attachment and the child temperament dimensions of mood, adaptability and regularity. Analyses to test hypotheses 3a to 3d were conducted using the complete-case sample, stratified by gender and family structure. Analyses to test hypotheses 3e and 3f were conducted on the intact two-parent family sample where a father or father figure had been present at each of the first three MCS waves, and for whom complete data on the father-child relationship measure at three years was available (n=3,802).

This section begins with a description of the parenting measures, emotional support and covariates of post-natal attachment scores and child temperament scores by gender and family structure. Second, the father-child relationship score and mother-father relationship quality score at nine months and three years are described by gender of child. Tests were conducted for statistical differences between the variables for boys and girls and two-parent and single-mother families, and significant differences found are reported in the text and tables.

The mother-child relationship quality score at three years, child's mood, and regularity at nine months were not statistically different by gender (Table 6.1). There was evidence that girls had a less adaptable temperament at nine months than boys, while post-natal attachment at nine months was slightly poorer between mothers and sons. The large majority of mothers were observed being warm towards their son or daughter during the data collection interview (97%); however, boys were shown significantly less warmth than girls. In addition, mothers were significantly more likely to be observed using hostile behaviour towards their sons than their daughters. Mothers were more likely to report smacking their sons once a month, once a week or once a day, and shouting at their sons daily, than their daughters. Maternal emotional support was not significantly different between families of boys and girls, or at nine months compared with three years. Around 88% of the mothers felt they had emotional support.

Table 6.1 Gender differences in parenting measures, covariates and emotional support

Parenting at 3 years	Boys (n=3,301)		Girls (n=3,202)	
	Mean	SE	Mean	SE
Mother-child relationship score [15–60]	25.6	0.13	25.0	0.14
Child temperament score				
Mood [4–20]	15.6	0.07	15.7	0.05
Adaptability [3–15]	12.8*	0.05	12.4*	0.05
Regularity [4–20]	17.6	0.05	17.6	0.05
Post-natal attachment score [0–16]	14.8*	0.04	15.0*	0.04
	n	%	n	%
Observed maternal warmth				
No	117	3.2*	116	3.0*
Observed maternal hostility				
Hostility	357	9.8*	203	4.9*
Smack child				
Never	977	29.7*	1,137	35.8*
Rarely	1,729	52.5*	1,681	51.8*
Once a month	212	7.1*	143	4.6*
Once a week	360	10.0*	225	7.3*
Daily	23	0.7*	16	0.4*
Shout at child				
Never	69	1.9*	97	3.0*
Rarely	964	29.1*	1,065	32.1*
Once a month	246	8.4*	280	9.4*
Once a week	1,380	42.5*	1,291	42.0*
Daily	642	18.1*	469	13.6*
No emotional support				
9 months				
Strongly disagree	1,532	48.5	1,557	50.3
Disagree	1,343	39.9	1,227	38.2
Neither	225	6.5	256	6.9
Agree/strongly agree	201	5.1	162	4.7
3 years				
Strongly disagree	1,535	47.2	1,480	47.9
Disagree	1,317	39.8	1,260	38.8
Neither	255	7.9	270	8.0
Agree/strongly agree	194	5.2	192	5.3

*Significant gender difference.

The distribution of parenting measures, covariates and emotional support by family structure is presented in Table 6.2. The mother-child relationship score was significantly higher for single mothers than coupled mothers, indicating a less positive, more negative mother-child relationship. This may be a result of the higher levels of psychological distress found in single mothers compared with coupled mothers,[133;142] which are associated with a poorer mother-child relationship. The temperaments of children of single mothers differed significantly to those found in children of two-parent families. Children of single mothers were better in mood but poorer in adaptability and regularity than children of two-parent families. Post-natal attachment did not differ significantly by family structure. Single mothers were significantly less likely to be observed showing warmth towards their child, and significantly more likely to be observed being hostile towards their child, than coupled mothers. The frequency of self-reported smacking did not vary between two-parent and single-mother families. Single mothers reported shouting at their child more frequently than coupled mothers and were much more likely to agree that they did not have emotional support at both nine months and three years compared with coupled mothers.

Table 6.2 Family structure differences in parenting, covariates and emotional support

Parenting at 3 years	Two parents (n=5,664)		Single mothers (n=839)	
	Mean	SE	Mean	SE
Mother-child relationship score [15-60]	25.11*	0.1136	27.01*	0.2812
Child temperament score				
Mood [4–20]	15.60*	0.0456	15.92*	0.1055
Adaptability [3–15]	12.64*	0.0360	12.31*	0.1019
Regularity [4–20]	17.66*	0.0384	16.89*	0.1468
Post-natal attachment score [0–16]	14.85	0.0338	14.95	0.0942
	n	%	n	%
Observed maternal warmth				
No	174	2.6*	59	7.0*
Observed maternal hostility				
Hostility	428	6.6*	132	14.2*
Smack child				
Never	1,822	32.6	292	33.9
Rarely	2,988	52.4	422	49.9
Once a month	319	5.9	36	5.5
Once a week	504	8.6	81	9.5
Daily	31	0.5	8	1.2
Shout at child				
Never	142	2.4*	24	2.7*
Rarely	1,740	30.3*	289	33.1*
Once a month	486	9.2*	40	5.4*
Once a week	2,388	42.9*	283	36.7*
Daily	908	15.2*	203	22.1*
No emotional support				
9 months				
Strongly disagree	2,874	51.8*	215	26.9*
Disagree	2,200	38.5*	370	43.8*
Neither	360	5.9*	121	14.3*
Agree/strongly agree	230	3.8*	133	15.0*
3 years				
Strongly disagree	2,760	49.6*	255	28.9*
Disagree	2,218	38.8*	359	44.2*
Neither	421	7.4*	104	12.9*
Agree/strongly agree	265	4.2*	121	14.0*

*Significant family structure difference.

Table 6.3 presents details of the distribution of the father-child relationship scores at three years, and mother-father relationship quality scores at nine months and three years, in the intact two-parent families, by gender.

Table 6.3 Gender differences in father-child relationship quality score and mother-father relationship quality score in intact two-parent families

Father-child and mother-father relationship quality	Two-parent families		
	n	**Mean**	**SE**
BOYS			
Father-child relationship quality score [15–55]	1,917	27.5	0.16
Mother-father relationship quality score [0–16]			
9 months	1,917	2.9	0.08
3 years	1,917	3.4	0.08
GIRLS			
Father-child relationship quality score [15–55]	1,885	27.1	0.18
Mother-father relationship quality score [0–16]			
9 months	1,885	2.9	0.07
3 years	1,885	3.3	0.08

Neither the father-child relationship quality score at three years, nor the mother-father relationship quality score at nine months and three years, differed significantly by the child's gender in the intact families. Mother-father relationship quality score was significantly higher at three years than at nine months in both the boys' and girls' sample, indicating a poorer-quality mother-father relationship at three years.

6.2.2 Testing the association between parenting, emotional support and mother-father relationship quality, maternal psychological distress and child externalising behaviour

Hypothesis 3a: Maternal psychological distress symptoms at nine months and three years, and child externalising behaviour symptoms at five years, are associated with maternal harsh discipline, low warmth and a lower quality mother-child relationship at three years. There will be no differences by gender or family structure.

Crude tests of association were conducted and the bivariate distributions examined between maternal psychological distress score at nine months and three years and child externalising behaviour score at five years, parenting measures at three years, emotional support at nine months and three years, and the covariates of child temperament and post-natal attachment. The analysis was conducted separately for boys and girls and two-parent and single-mother families. Details of the tests of association and bivariate distributions are presented in Appendix 6.1 by gender, and 6.2 by family structure. Key findings are summarised here in the text.

For boys and girls, most of the parenting measures, including mother-child relationship, parental warmth and hostility, smacking and shouting at the child at three years, were significantly associated with maternal psychological distress at nine months and three years and child externalising behaviour at five years. The exception was maternal hostility, which was not significantly associated with maternal psychological distress at nine months in the sample of boys. A dose-response pattern in the relationships was found, in that as parenting became less warm or increasingly harsh, mean child externalising behaviour scores at five years increased. This dose-response relationship was the same for boys and girls. Emotional support at nine months and three years, post-natal attachment, and the

child's mood and regularity at nine months were all associated with both maternal psychological distress at nine months and three years and externalising behaviour at five years in the boys and girls. Boys' adaptability at nine months was not significantly associated with maternal psychological distress at three years or externalising behaviour at five years.

In two-parent families, most of the parenting behaviours were found to be associated with maternal psychological distress at nine months and three years and child externalising behaviour at five years, with the exception of parental hostility, which was not associated with maternal psychological distress at nine months. In the single-mother families, a significant association was found between all of the parenting behaviours and child externalising behaviour at five years, and between the mother-child relationship, parental hostility, parental warmth, smacking and shouting at the child and maternal psychological distress at three years. Only the mother-child relationship and shouting at the child were associated with maternal psychological distress at nine months in the single mothers. Emotional support at nine months and three years was associated with maternal psychological distress at nine months and three years, and with externalising behaviour at five years in both the two-parent and single-mother families. In the two-parent families, child temperament (including mood, adaptability and regularity) and post-natal attachment were associated with both the exposures and the outcome, with the exception of child adaptability, which was not significantly associated with child externalising behaviour at five years. In the single-mother families, child mood, adaptability and regularity and post-natal attachment were associated with maternal psychological distress at nine months. Child mood, adaptability and regularity and post-natal attachment were associated with maternal psychological distress at three years, while child regularity and post-natal attachment were associated with child

externalising behaviour at five years. Following the crude tests of association, all of the parenting measures, emotional support, covariates of child temperament (mood, adaptability and regularity) and post-natal attachment were retained as covariates to be controlled for in the multivariate analysis across all of the samples.

Hypothesis 3a was tested using linear regression models of the association between each of the parenting measures separately, maternal psychological distress at nine months and three years, and externalising behaviour at five years, adjusting for the child and mother covariates, socio-economic position, post-natal attachment and child temperament. For the purposes of the regression analyses some of the parenting measure categories were collapsed together, to ensure adequate cell sizes across the samples (≥50).

Table 6.4 shows the adjusted association between each parenting measure and maternal psychological distress at nine months and three years and child externalising behaviour at five years in the boys and girls. In the adjusted models, the mother-child relationship was significantly positively associated with maternal psychological distress at nine months and three years and externalising behaviour at five years in both the boys and girls. Mothers' shouting at their son or daughter once a week or daily (compared with never/rarely/monthly) was significantly associated with maternal psychological distress at nine months and three years and externalising behaviour at five years.

Table 6.4 The association between maternal psychological distress, externalising behaviour and parenting (individual effects), by gender

Parenting at 3 years	BOYS				GIRLS			
		Maternal psychological distress		Externalising behaviour		Maternal psychological distress		Externalising behaviour
		9 months Model 1	3 years Model 2	5 years Model 3		9 months Model 1	3 years Model 2	5 years Model 3
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
Mother-child relationship	3,301	**0.05 (0.04, 0.06)**	**0.16 (0.14, 0.18)**	**0.20 (0.18, 0.21)**	3,202	**0.04 (0.03, 0.05)**	**0.15 (0.13, 0.18)**	**0.17 (0.15, 0.19)**
Parental warmth								
Yes	3,184	0.00	0.00	0.00	3,086	0.00	0.00	0.00
No	117	0.20 (-0.17, 0.57)	**1.06 (0.06, 2.06)**	**0.89 (0.16, 1.62)**	116	0.39 (-0.02, 0.80)	0.35 (-0.69, 1.39)	0.50 (-0.34, 1.33)
Parental hostility								
No hostility	2,944	0.00	0.00	0.00	2,999	0.00	0.00	0.00
Hostility	357	-0.03 (-0.22, 0.16)	0.33 (-0.11, 0.77)	**0.96 (0.57, 1.34)**	203	0.06 (-0.22, 0.35)	0.38 (-0.19, 0.95)	**1.15 (0.64, 1.67)**
Smack child								
Never/rarely/monthly	2,918	0.00	0.00	0.00	2,961	0.00	0.00	0.00
Once a week/daily	383	**0.32 (0.10, 0.53)**	**0.70 (0.24, 1.17)**	**1.13 (0.69, 1.57)**	241	0.19 (-0.02, 0.39)	**0.99 (0.38, 1.60)**	**1.16 (0.72, 1.60)**
Shout at child								
Never/rarely/monthly	1,279	0.00	0.00	0.00	1,442	0.00	0.00	0.00
Once a week	1,380	0.07 (-0.07, 0.21)	**0.36 (0.09, 0.63)**	**0.81 (0.53, 1.09)**	1,291	**0.14 (0.01, 0.27)**	**0.58 (0.32, 0.85)**	**0.62 (0.40, 0.85)**
Daily	642	**0.37 (0.18, 0.55)**	**1.12 (0.71, 1.53)**	**1.88 (1.48, 2.29)**	469	**0.28 (0.09, 0.46)**	**1.20 (0.76, 1.64)**	**1.77 (1.44, 2.09)**

Bold text $p < .05$ for coefficient.
Model one adjusting for: family structure at nine months, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).
Model two adjusting for: family structure at three years, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).
Model three adjusting for: family structure at nine months, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).

In the boys, a higher frequency of smacking was associated with maternal psychological distress at nine months and three years and externalising behaviour at five years, while in the girls a higher frequency of smacking was associated with maternal psychological distress at three years and externalising behaviour at five years. In boys, a lack of maternal warmth was associated with maternal psychological distress at three years and externalising behaviour at five years, but this was not the case in girls. Interviewer-observed maternal hostility was associated with externalising behaviour at five years in both boys and girls, but not with maternal psychological distress at nine months or three years.

Table 6.5 shows the association between each parenting measure and maternal psychological distress at nine months and three years and child externalising behaviour at five years, by family structure. In both the two-parent and single-mother families, a worse mother-child relationship was significantly associated with maternal psychological distress at nine months and three years and externalising behaviour at five years. In the two-parent families, a higher frequency of mother-reported smacking and shouting at the child was associated with maternal psychological distress at nine months and three years and externalising behaviour at five years, while a lack of warmth and increased hostility was associated with externalising behaviour at five years. In the single-mother families, increased frequency of smacking or shouting at the child was associated with maternal psychological distress at three years and child externalising behaviour at five years.

Table 6.5 The association between maternal psychological distress, externalising behaviour and parenting (individual effects), by family structure

Parenting at 3 years	TWO PARENTS				SINGLE MOTHERS			
		Maternal psychological distress		Externalising behaviour		Maternal psychological distress		Externalising behaviour
		9 months Model 1	3 years Model 2	5 years Model 3		9 months Model 1	3 years Model 2	5 years Model 3
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
Mother-child relationship	5,664	**0.05 (0.04, 0.05)**	**0.15 (0.13, 0.16)**	**0.18 (0.17, 0.19)**	839	**0.03 (0.01, 0.05)**	**0.21 (0.17, 0.26)**	**0.21 (0.17, 0.25)**
Parental warmth								
Yes	5,490	0.00	0.00	0.00	780	0.00	0.00	0.00
No	174	0.32 (-0.02, 0.66)	0.75 (-0.10, 1.60)	**0.71 (0.13, 1.29)**	59	0.36 (-0.22, 0.94)	0.85 (-0.81, 2.50)	0.97 (-0.37, 2.31)
Parental hostility								
No hostility	5,236	0.00	0.00	0.00	707	0.00	0.00	0.00
Hostility	428	-0.03 (-0.19, 0.13)	0.32 (-0.07, 0.71)	**0.93 (0.59, 1.26)**	132	0.15 (-0.28, 0.58)	0.56 (-0.44, 1.55)	**1.65 (0.71, 2.58)**
Smack child								
Never/rarely/monthly	5,129	0.00	0.00	0.00	750	0.00	0.00	0.00
Once a week/daily	535	**0.31 (0.13, 0.48)**	**0.79 (0.39, 1.20)**	**1.08 (0.76, 1.41)**	89	-0.01 (-0.46, 0.43)	**1.36 (0.30, 2.42)**	**1.73 (0.75, 2.70)**
Shout at child								
Never/rarely/monthly	2,368	0.00	0.00	0.00	353	0.00	0.00	0.00
Once a week	2,388	**0.13 (0.03, 0.23)**	**0.50 (0.31, 0.69)**	**0.69 (0.50, 0.87)**	283	0.06 (-0.25, 0.36)	0.36 (-0.34, 1.06)	**1.05 (0.46, 1.65)**
Daily	908	**0.36 (0.22, 0.51)**	**1.10 (0.79, 1.42)**	**1.81 (1.51, 2.10)**	203	0.24 (-0.08, 0.55)	**1.78 (0.91, 2.66)**	**2.02 (1.37, 2.67)**

Bold text $p < .05$ for coefficient.

Model one adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).

Model two adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).

Model three adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).

Observed lack of warmth was not significantly associated with maternal psychological distress at nine month or three years or child externalising behaviour at five years, while observed hostility was associated with externalising behaviour at five years, in the single-mother families.

With respect to hypothesis 3a, it appeared that maternal psychological distress at nine months and three years and child externalising behaviour at five years were associated with maternal reports of increased harsh discipline and with the quality of the mother-child relationship in boys and girls, two-parent and single-mother families. Observed lack of warmth and increased hostility were associated with child externalising behaviour at five years across all of the samples.

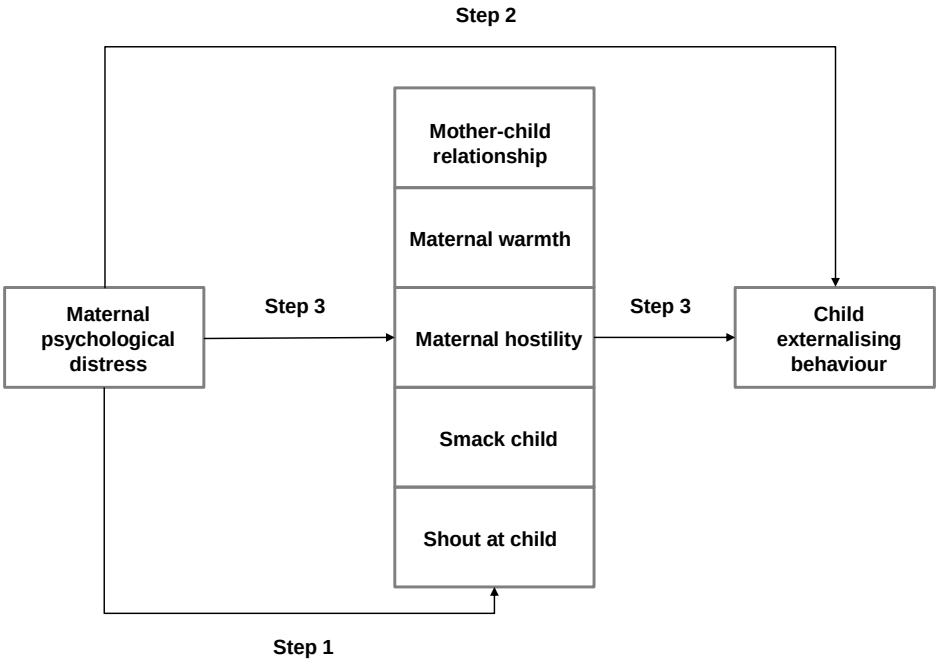
6.2.3 The mediating role of parenting in the relationship between maternal psychological distress and child externalising behaviour

Hypothesis 3b: The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years operates through parenting behaviour at three years. There will be no differences by gender or family structure.

Hypothesis 3c: The mother-child relationship quality is the strongest parenting mediator in the association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years. There will be no differences by gender, and a stronger association in single-mother families compared with two-parent families.

The three-step mediation analysis approach used here is described in detail in the methods chapter, and in brief here. The mediation model (Figure 6.1) shows a pathway from maternal psychological distress at nine months and three years to child externalising behaviour at five years via parenting behaviours at three years.

Figure 6.1 The mediation model for parenting at three years in the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years



Step one of the mediation analysis tests whether the exposure (maternal psychological distress at nine months and three years) affects the mediator (parenting behaviour). This was tested by regressing each parenting measure (mediator) on maternal psychological distress (exposure) at nine months and three years. The regression models were adjusted for the child and mother covariates, SEP, and the parenting covariates of post-natal attachment and child temperament.

In boys, girls, two-parent and single-mother families (Table 6.6), the quality of the mother-child relationship at three years worsened with increasing maternal psychological distress at nine months and three years. Higher maternal psychological distress at nine months was also significantly positively associated with a lack of parental warmth in the girls and two-parent families, an increased frequency of smacking in the boys and two-parent families, and an increased frequency of shouting in the boys, girls and two-parent families. Maternal psychological distress at nine months was not significantly associated with these parenting behaviours in the single-mother families. As in previous single-mother analyses, the lack of significant associations may be a result of the smaller sample size having insufficient power to detect an association. However, increased maternal psychological distress at three years was significantly positively associated with a lack of parental warmth in the boys and two-parent families, and with an increased frequency of smacking and shouting at the child, across all the samples. Maternal psychological distress at nine months and three years was not statistically associated with interviewer-observed parental hostility in any of the samples.

Table 6.6 Step one mediation: the association between maternal psychological distress and parenting, by gender and family structure

Maternal psychological distress	PARENTING at 3 years									
	Mother-child relationship	Parental warmth		Parental hostility		Smack child		Shout at child		
		Yes	No	No hostility	Hostility	Never/rarely /monthly	Weekly/ daily	Never/rarely /monthly	Weekly	Daily
	Coeff. (95% CI)	Ref	OR (95% CI)	Ref	OR (95% CI)	Ref	OR (95% CI)	Ref	OR (95% CI)	OR (95% CI)
BOYS * *n=*	*3,301*	*3,184*	*117*	*2,944*	*357*	*2,918*	*383*	*1,279*	*1,380*	*642*
9 months	**0.85 (0.68, 1.01)**	0.00	1.08 (0.95, 1.23)	0.00	0.99 (0.91, 1.07)	0.00	**1.13 (1.04, 1.22)**	0.00	1.04 (0.97, 1.11)	**1.17 (1.07, 1.26)**
3 years	**0.63 (0.54, 0.71)**	0.00	**1.07 (1.02, 1.13)**	0.00	1.03 (0.99, 1.06)	0.00	**1.06 (1.02, 1.09)**	0.00	**1.04 (1.01, 1.08)**	**1.10 (1.07, 1.14)**
GIRLS* *n=*	*3,202*	*3,086*	*116*	*2,999*	*203*	*2,961*	*241*	*1,442*	*1,291*	*469*
9 months	**0.68 (0.49, 0.87)**	0.00	**1.15 (1.00, 1.32)**	0.00	1.03 (0.91, 1.17)	0.00	1.08 (0.99, 1.18)	0.00	**1.08 (1.01, 1.15)**	**1.13 (1.04, 1.23)**
3 years	**0.58 (0.50, 0.66)**	0.00	1.03 (0.96, 1.11)	0.00	1.04 (0.99, 1.08)	0.00	**1.09 (1.04, 1.14)**	0.00	**1.07 (1.04, 1.11)**	**1.12 (1.08, 1.16)**
TWO PARENTS** *n=*	*5,664*	*5,490*	*174*	*5,236*	*428*	*5,129*	*535*	*2,368*	*2,388*	*908*
9 months	**0.81 (0.68, 0.94)**	0.00	**1.14 (1.01, 1.28)**	0.00	0.99 (0.91, 1.06)	0.00	**1.13 (1.06, 1.21)**	0.00	**1.07 (1.02, 1.13)**	**1.18 (1.10, 1.26)**
3 years	**0.59 (0.53, 0.65)**	0.00	**1.06 (1.00, 1.12)**	0.00	1.03 (0.99, 1.07)	0.00	**1.07 (1.04, 1.10)**	0.00	**1.07 (1.04, 1.09)**	**1.12 (1.09, 1.15)**
SINGLE MOTHER** *n=*	*839*	*780*	*59*	*707*	*132*	*750*	*89*	*353*	*283*	*203*
9 months	**0.57 (0.21, 0.93)**	0.00	1.12 (0.94, 1.33)	0.00	1.05 (0.91, 1.20)	0.00	0.99 (0.86, 1.13)	0.00	1.02 (0.91, 1.14)	1.07 (0.96, 1.19)
3 years	**0.72 (0.56, 0.88)**	0.00	1.05 (0.97, 1.14)	0.00	1.03 (0.98, 1.08)	0.00	**1.07 (1.02, 1.13)**	0.00	1.03 (0.98, 1.09)	**1.11 (1.06, 1.17)**

Bold text p < .05 for coefficient.
*Adjusting for: family structure at nine months or three years, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.
**Adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.

In the second step of the mediation analysis, the effect of the exposure (maternal psychological distress at nine months and three years) on the outcome (child externalising behaviour at five years) was tested by gender (Table 6.7) and family structure (Table 6.8). This association was tested in Chapter 4 in the complete-case sample, but is repeated here for the stratified samples. Maternal psychological distress at nine months and three years was significantly positively associated with externalising behaviour at five years in the boys and girls and two-parent and single-mother families after controlling for the child and mother covariates, SEP, and the parenting covariates post-natal attachment and child temperament.

Step three of the mediation analysis consisted of adding all of the parenting variables to the regression models of the association between maternal psychological distress at nine months and three years and externalising behaviour at five years. In order for mediation to be present, step one and two criteria had to be met, and the addition of the parenting variables had to attenuate the association between maternal psychological distress at nine months and three years and externalising behaviour at five years.

For the association between maternal psychological distress at nine months and externalising behaviour at five years, the addition of the parenting measures attenuated the association by around 42% in boys and 46% in girls (Table 6.7), 47% in two-parent families and 33% in single-mother families (Table 6.8). For the association between maternal psychological distress at three years and externalising behaviour at five years, the addition of the parenting variables attenuated the association by around 60% in boys and 53% in girls (Table 6.7), 56% in two-parent families and 71% in single-mother families (Table 6.8).

Table 6.7 Step two and three mediation: the role of parenting in the association between maternal psychological distress and externalising behaviour, by gender

Maternal psychological distress	BOYS				GIRLS			
		Externalising behaviour at 5 years[1]	+ Parenting at 3 years[2]	+ Parenting at 3 years[2]		Externalising behaviour at 5 years[1]	+ Parenting at 3 years[2]	+ Parenting at 3 years[2]
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
9 months	3,301	**0.38 (0.30, 0.46)**	**0.22 (0.14, 0.29)**		3,202	**0.26 (0.17, 0.34)**	**0.14 (0.07, 0.22)**	
3 years	3,301	**0.20 (0.16, 0.24)**		**0.08 (0.04, 0.12)**	3,202	**0.17 (0.13, 0.21)**		**0.08 (0.04, 0.12)**
Mother-child relationship	3,301		**0.17 (0.15, 0.19)**	**0.17 (0.15, 0.19)**	3,202		**0.15 (0.13, 0.17)**	**0.14 (0.12, 0.17)**
Parental warmth								
Yes	3,184		0.00	0.00	3,086		0.00	0.00
No	117		0.09 (-0.51, 0.69)	0.06 (-0.54, 0.67)	116		0.30 (-0.46, 1.07)	0.33 (-0.44, 1.10)
Parental hostility								
No hostility	2,944		0.00	0.00	2,999		0.00	0.00
Hostility	357		**0.50 (0.14, 0.86)**	**0.47 (0.11, 0.84)**	203		**0.59 (0.11, 1.07)**	**0.59 (0.12, 1.06)**
Smack child								
Never/rarely/monthly	2,918		0.00	0.00	2,961		0.00	0.00
Once a week/daily	383		0.19 (-0.28, 0.65)	0.21 (-0.25, 0.67)	241		0.26 (-0.16, 0.68)	0.24 (-0.19, 0.66)
Shout at child								
Never/rarely/monthly	1,279		0.00	0.00	1,442		0.00	0.00
Once a week	1,380		**0.40 (0.16, 0.64)**	**0.39 (0.15, 0.63)**	1,291		**0.28 (0.06, 0.49)**	**0.26 (0.05, 0.48)**
Daily	642		**0.81 (0.41, 1.21)**	**0.81 (0.42, 1.21)**	469		**0.86 (0.51, 1.20)**	**0.85 (0.50, 1.09)**

Bold text p < .05 for coefficient.
1 Adjusting for: family structure at nine months or three years, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.
2 As 1, additionally adjusting for mother-child relationship, parental warmth, parental hostility, smacking the child and shouting at the child.

Table 6.8 Step two and three mediation: the role of parenting in the association between maternal psychological distress and externalising behaviour, by family structure

Maternal psychological distress	TWO PARENTS				SINGLE MOTHER			
		Externalising behaviour at 5 years[1]	+ Parenting at 3 years[2]	+ Parenting at 3 years[2]		Externalising behaviour at 5 years[1]	+ Parenting at 3 years[2]	+ Parenting at 3 years[2]
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
9 months	5,664	**0.32 (0.26, 0.38)**	**0.17 (0.11, 0.23)**		839	**0.36 (0.19, 0.52)**	**0.24 (0.10, 0.37)**	
3 years	5,664	**0.18 (0.15, 0.21)**		**0.08 (0.05, 0.11)**	839	**0.21 (0.14, 0.27)**		0.06 (-0.00, 0.13)
Mother-child relationship	5,664		**0.16 (0.14, 0.17)**	**0.15 (0.14, 0.17)**	839		**0.19 (0.14, 0.23)**	**0.18 (0.13, 0.22)**
Parental warmth								
Yes	5,490		0.00	0.00	780		0.00	0.00
No	174		0.24 (-0.25, 0.72)	0.24 (-0.24, 0.73)	59		0.29 (-0.86, 1.43)	0.34 (-0.83, 1.51)
Parental hostility								
No hostility	5,236		0.00	0.00	707		0.00	0.00
Hostility	428		**0.52 (0.18, 0.85)**	**0.49 (0.16, 0.83)**	132		0.59 (-0.17, 1.35)	0.64 (-0.13, 1.40)
Smack child								
Never/rarely/monthly	5,129		0.00	0.00	750		0.00	0.00
Once a week/daily	535		0.21 (-0.12, 0.53)	0.21 (-0.11, 0.53)	89		0.50 (-0.49, 1.48)	0.43 (-0.59, 1.45)
Shout at child								
Never/rarely/monthly	2,368		0.00	0.00	353		0.00	0.00
Once a week	2,388		**0.32 (0.15, 0.50)**	**0.31 (0.14, 0.49)**	283		0.47 (-0.06, 1.01)	0.49 (-0.05, 1.03)
Daily	908		**0.89 (0.57, 1.20)**	**0.88 (0.56, 1.20)**	203		0.39 (-0.25, 1.04)	0.39 (-0.26, 1.04)

Bold text $p < .05$ for coefficient.

1 Adjusting for: gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared), birth order, equivalised family income, self-rated financial status, maternal education, housing tenure and overcrowding.

2 As 1, additionally adjusting for mother-child relationship, parental warmth, parental hostility, smacking the child and shouting at the child.

Following the addition of all of the parenting behaviours to the model, the association between maternal psychological distress at three years and child externalising behaviour at five years was attenuated to the degree that it became non-significant in the single-mother families. On the whole these results suggest that parenting did act to mediate the effects of maternal psychological distress at nine months and three years on child externalising behaviour at five years in the boys and girls, and in two-parent and single-mother families, as hypothesised (3b). Parenting behaviours concurrent with maternal psychological distress at three years appeared to have a stronger mediating effect across all of the samples.

However, not all of the parenting dimensions met all three mediation criteria,[283] and this varied depending on the sample. Observed maternal warmth, self-reported smacking and shouting at the child did not meet criterion one of mediation in the single-mother families. Observed maternal hostility did not meet mediation criteria one across all four samples; however, it was independently associated with externalising behaviour at five years in boys and girls and two-parent families. The mother-child relationship quality met criteria one and two across all of the samples, and shouting at the child met criteria one and two in all samples bar single mothers. Drawing these results together, the evidence suggests that in the mutually adjusted models, mother-child relationship quality and shouting at the child operate as mediators in the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years, whereas observed parental warmth and hostility and self-reported smacking do not.

Previous evidence had suggested that the mother-child relationship would be the strongest parenting mediator in the association between maternal psychological distress and child externalising behaviour, and this was tested (hypothesis 3c) by

gender and family structure. The same analytical process was used as in the previous section of this chapter, except that each parenting measure was tested separately for its mediating effect in the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years. The results are presented in Table 6.9. As expected, the results show that the greatest attenuation in the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years occurs with the addition of mother-child relationship quality to the model, compared with the other individual parenting measures. This is the case across all of the stratified samples.

Table 6.9 Step two and three mediation: the role of each parenting measure in the association between maternal psychological distress and externalising behaviour, by gender and family structure

Maternal psychological distress		Externalising behaviour at 5 years					
		Externalising behaviour at 5 years[1]	+ Mother-child relationship	+Parental warmth	+ Parental hostility	+ Smack child	+ Shout at child
	n	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)	Coeff. (95% CI)
BOYS							
9 months	3,301	**0.38 (0.30, 0.46)**	**0.22 (0.14, 0.30)**	**0.37 (0.29, 0.45)**	**0.38 (0.30, 0.46)**	**0.36 (0.28, 0.44)**	**0.34 (0.26, 0.42)**
3 years	3,301	**0.20 (0.16, 0.24)**	**0.08 (0.04, 0.13)**	**0.20 (0.16, 0.24)**	**0.20 (0.16, 0.24)**	**0.19 (0.15, 0.23)**	**0.18 (0.14, 0.22)**
GIRLS							
9 months	3,202	**0.26 (0.17, 0.34)**	**0.15 (0.07, 0.22)**	**0.26 (0.17, 0.34)**	**0.26 (0.17, 0.34)**	**0.25 (0.17, 0.33)**	**0.23 (0.15, 0.32)**
3 years	3,202	**0.17 (0.13, 0.21)**	**0.08 (0.04, 0.12)**	**0.17 (0.13, 0.21)**	**0.17 (0.13, 0.21)**	**0.17 (0.13, 0.21)**	**0.15 (0.11, 0.19)**
TWO PARENTS							
9 months	5,664	**0.32 (0.26, 0.38)**	**0.18 (0.12, 0.24)**	**0.31 (0.25, 0.37)**	**0.32 (0.26, 0.38)**	**0.30 (0.24, 0.36)**	**0.28 (0.22, 0.34)**
3 years	5,664	**0.18 (0.15, 0.21)**	**0.08 (0.05, 0.12)**	**0.18 (0.15, 0.21)**	**0.18 (0.15, 0.21)**	**0.18 (0.15, 0.21)**	**0.16 (0.13, 0.19)**
SINGLE MOTHER							
9 months	839	**0.36 (0.19, 0.52)**	**0.24 (0.10, 0.38)**	**0.35 (0.19, 0.51)**	**0.35 (0.18, 0.51)**	**0.36 (0.20, 0.51)**	**0.34 (0.18, 0.49)**
3 years	839	**0.21 (0.14, 0.27)**	0.06 (-0.00, 0.13)	**0.20 (0.14, 0.27)**	**0.20 (0.14, 0.26)**	**0.19 (0.13, 0.26)**	**0.18 (0.12, 0.25)**

Bold text $p < .05$ for coefficient.
1 Adjusting for: family structure at nine months or three years or gender, birthweight, child's age at MCS3 (days), mother's age at birth in years (and mother's age squared),birth order, equivalised family income, self-rated financial status, maternal education, housing tenure, overcrowding, post-natal attachment and child temperament (mood, adaptability and regularity).
2 As 1, plus mother-child relationship.
3 As 1, plus parental warmth.
4 As 1, plus parental hostility.
5 As 1, plus smacking the child.
6 As 1, plus shouting at the child.

6.2.4 The moderating role of emotional support

Hypothesis 3d: The relationship between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at five years is stronger in the context of low emotional support (moderator). There will be no difference by gender or family structure.

In order to test hypothesis 3d, two-by-two interaction terms were derived for emotional support x concurrent maternal psychological distress. These were then added to the fully adjusted linear regression models of the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years. The emotional support variable categories were combined to create a binary emotional support variable, with the aim of increasing the cell size of the categories and enhancing the power of the interaction tests. This approach also offered an alternative sensitivity analysis, as a larger sample was not available for sensitivity testing at this stage of the analysis using the fully adjusted models. Post-regression Wald tests (p-values) were used to identify any interaction following the addition of the interaction term to each model. There was no evidence of a moderating effect by emotional support level in the relationship between maternal psychological distress at nine months or three years and child externalising behaviour at five years. This was tested using the emotional support measure as a categorical and binary measure for sensitivity purposes.

6.2.5 The moderating role of father-child relationship quality

Hypothesis 3e: Among two-parent families, the relationship between maternal psychological distress symptoms in the early years and externalising behaviour symptoms in boys and girls at five years is stronger in the context of a poor father-child relationship at three years compared with families with a fair or good father-child relationship.

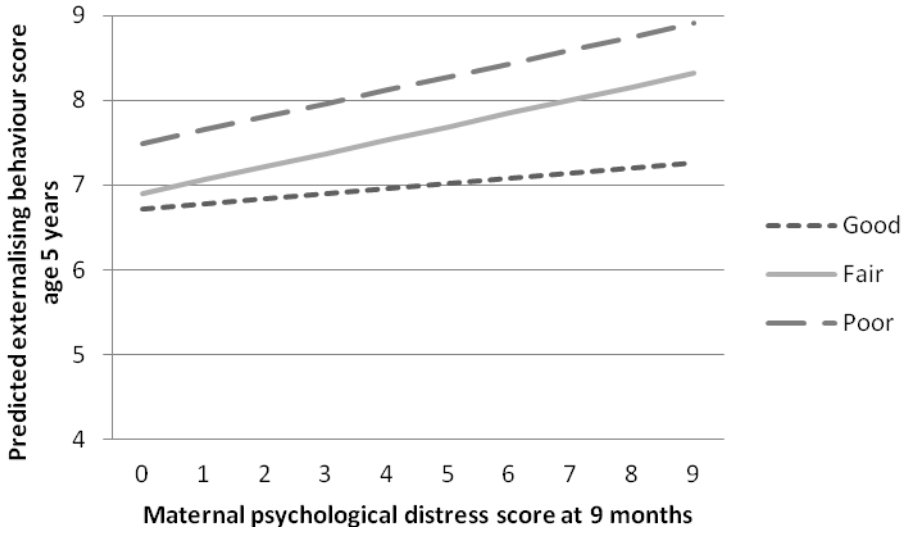
In order to test hypothesis 3e, two-way interaction terms were derived for maternal psychological distress (nine months and three years) x father-child relationship score. For sensitivity analyses, interaction terms were also derived for maternal psychological distress (nine months and three years) x father-child relationship tertiles. The interaction terms were then added to the fully adjusted linear regression models of the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years. The analyses were conducted on the intact two-parent families' sample for boys and girls separately. Post-regression Wald tests (p-values) were used to identify any interaction following the addition of the interaction term to each model.

All of the tests of interaction were non-significant ($p \geq 0.05$). However, those for the father-child relationship quality score and father-child relationship quality tertile in the association between maternal psychological distress at nine months and child externalising behaviour at five years in boys were of nearly borderline significance, being $p=0.092$ and $p=0.082$ respectively. This potential interaction was explored further by plotting the predicted regression lines of the relationship between maternal psychological distress at nine months and child externalising behaviour at

five years by the father-child relationship score tertiles for boys (Figure 6.2), and for girls (Figure 6.3) for comparison.

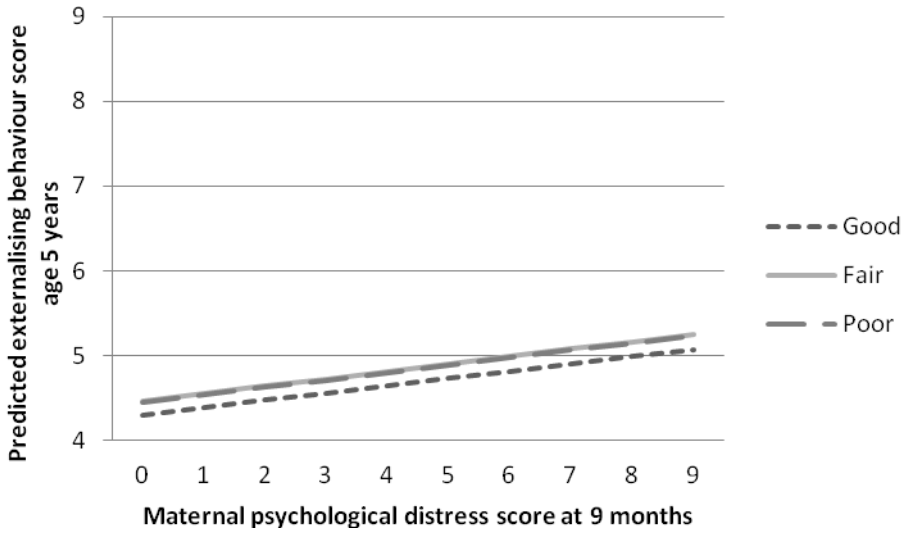
Figure 6.2 shows the predicted regression lines for the relationship between maternal psychological distress at nine months and boys' externalising behaviour at five years for each of the father-child relationship quality tertiles nominally labelled 'good', 'fair' and 'poor'. The shallowest gradient can be seen for the association between maternal psychological distress at nine months and externalising behaviour score at five years in boys with a 'good' father-son relationship at three years. Conversely, the steeper gradients can be seen for the association between maternal psychological distress at nine months and externalising behaviour at five years in the context of a 'fair' or 'poor' father-son relationship at three years.

Figure 6.2 The relationship between maternal psychological distress score and externalising behaviour score in boys of intact two-parent families (n=1,917) by father-child relationship quality at three years



For comparison, the predicted regression lines of the relationship between maternal psychological distress at nine months and child externalising behaviour at five years by father-daughter relationship quality tertiles were plotted (Figure 6.3). Here the predicted association between maternal psychological distress at nine months and externalising behaviour at five years shows no difference in the context of a 'fair' or 'poor' father-daughter relationship, as illustrated by the overlapping regression lines. Girls with a 'good' father-daughter relationship have a slightly lower mean externalising behaviour score at five years than those with a 'fair' or 'poor' father-daughter relationship, but the association between maternal psychological distress at nine months and girls' externalising behaviour at five years appears to operate similarly across the father-daughter relationship quality tertiles, as indicated by the parallel lines.

Figure 6.3 The relationship between maternal psychological distress score and externalising behaviour score in girls of intact two-parent families (n=1,885) by father-child relationship quality at three years



Hypothesis 3e states that the relationship between maternal psychological distress at nine months and three years and externalising behaviour at five years in boys and girls will be stronger in the intact two-parent families of boys and girls with a poor father-child relationship at three years. The results suggest that for boys, but not girls, the association between maternal psychological distress at nine months and externalising behaviour at five years is stronger in the context of a 'poor' or 'fair' father-son relationship and weaker in the presence of a 'good' father-son relationship. This highlights a gender-specific effect of father-child relationship quality in boys, and is consistent with same-sex theory, which proposes that the same-sex parent may have a stronger effect on child outcomes.[166]

6.2.6 The moderating role of mother-father relationship quality

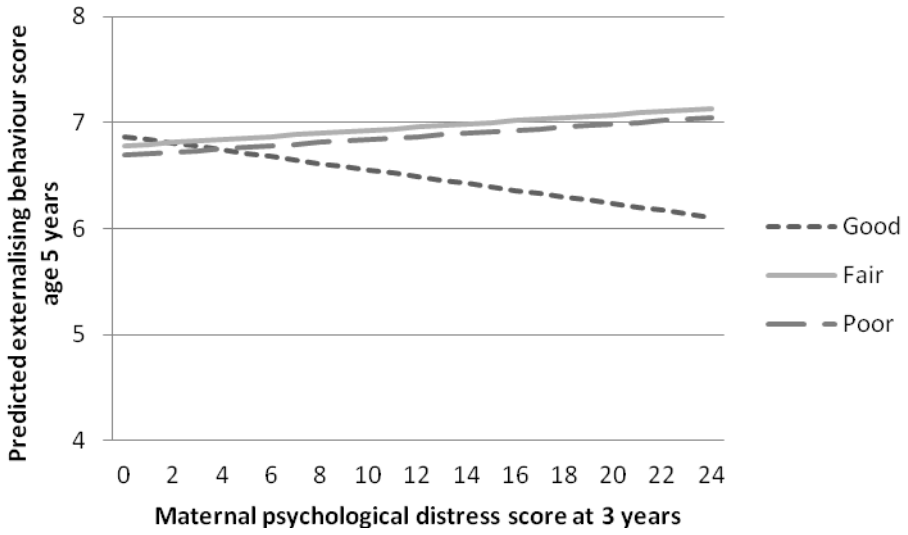
Hypothesis 3f: Among two-parent families, the relationship between maternal psychological distress symptoms in the early years and externalising behaviour symptoms in boys and girls at five years is stronger in the context of a poor mother-father relationship quality at three years compared with families with a fair or good mother-father relationship.

In order to test hypothesis 3f, two-way interaction terms were derived for maternal psychological distress (nine months and three years) x mother-father relationship quality (nine months and three years). Interaction terms were also derived for mother-father relationship quality tertiles for sensitivity analyses. The interaction terms were then added to the fully adjusted linear regression models of the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years. The analyses were conducted on the intact two-parent families' sample for boys and girls separately, and post-

regression Wald tests (p-values) were used to identify any interaction following the addition of the interaction term to each model.

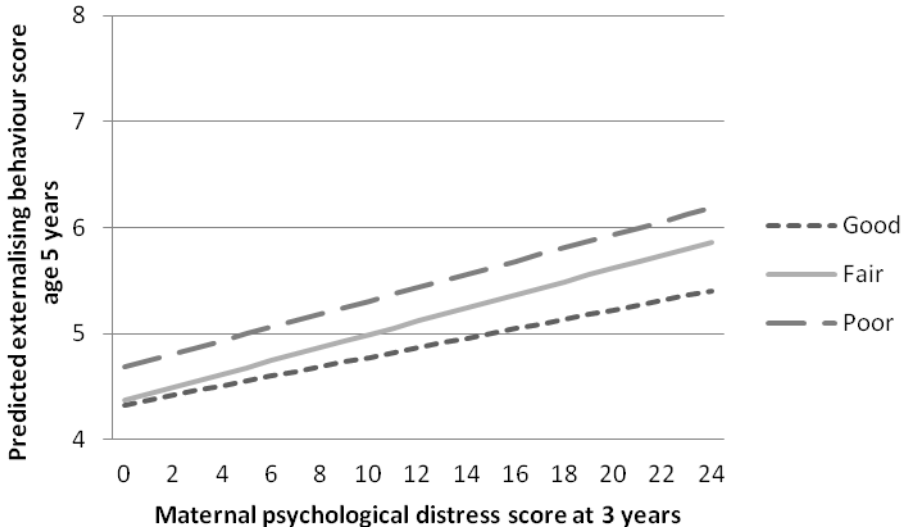
There was no clear evidence of a moderating effect by mother-father relationship quality. However, in the relationship between maternal psychological distress at three years and boys' externalising behaviour score at five years, the moderating effect of the mother-father relationship quality tertile was of borderline significance (p=0.063). To examine the potential moderating effect of mother-father relationship quality in the relationship between maternal psychological distress at three years and boys' externalising behaviour at five years, the predicted regression lines were plotted for each mother-father relationship quality tertile (Figure 6.4). In addition, the same association and interaction for the girls, which had not been significant, was plotted for comparison (Figure 6.5). Figure 6.4 shows that for boys living in the family context of a 'poor' or 'fair' mother-father relationship, the relationship between maternal psychological distress at three years and externalising behaviour score at five years were of a similar strength and direction, illustrated by the predicted regression lines running closely together and in parallel. For boys living in a family context of a 'good' mother-father relationship at three years, the association between maternal psychological distress at three years and externalising behaviour at five years appears to become inverted, so that a higher maternal psychological distress score is associated with a lower externalising behaviour score.

Figure 6.4 The relationship between maternal psychological distress score and externalising behaviour score in boys of intact two-parent families (n=1,917) by mother-father relationship quality at three years



In the girls (Figure 6.5), the relationship between maternal psychological distress at three years and externalising behaviour at five years in the family context of a 'poor', 'fair' or 'good' mother-father relationship are of a similar strength, illustrated by the almost parallel regression lines. There is some evidence that the relationship between maternal psychological distress at three years and externalising behaviour at five years is slightly weaker in the context of a 'good' mother-father relationship, as indicated by the slightly lesser gradient in the predicted externalising behaviour score line, although this effect was not statistically significant.

Figure 6.5 The relationship between maternal psychological distress score and externalising behaviour score in girls of intact two-parent families (n=1,885) by mother-father relationship quality at three years



The results appear to suggest that for boys the relationship between maternal psychological distress at three years and externalising behaviour at five years operates differently, depending on the family context, specifically the mother-father relationship quality. Indeed, this evidence goes one step further to show that living in a family with a 'good' mother-father relationship may be protective against the effects of maternal psychological distress at three years on boys' externalising behaviour score at five years. Of course, caution is needed in interpreting these results, as this effect modification was only found in the association between maternal psychological distress at three years and boys' externalising behaviour score at five years, and therefore a chance result cannot be ruled out.

6.3 Main findings and discussion

This last results chapter explored the role of various maternal parenting behaviours in the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years. In addition, potential father effects in this relationship were explored in the form of the father-child relationship quality and mother-father relationship quality. Some interesting gender differences were found. The attachment relationship at nine months between mothers and sons was slightly poorer than that between mothers and daughters, and yet at the same time it appeared that girls had a less adaptable temperament than boys, although mood and regularity did not differ by gender. One explanation for the slightly poorer mother-son attachment relationship may lie in evidence of gender differences in early development. It is known that, on the whole, newborn boys tend to be less physiologically developed than girls, lagging by about four to six weeks.[294] This in turn has led some developmental professionals to believe that boys are generally more difficult to parent in the early months and years, and that this in turn may affect the formation of secure attachment.[295] Of course, this difference in attachment was not tested to any further degree, and therefore it could be explained by other confounding factors or by chance. Gender differences in maternal parenting at three years were also found in the cohort. Significantly higher levels of observed hostility, lower levels of observed warmth and maternal-reported harsh discipline were found for boys than for girls. This may be explained by the significantly higher levels of externalising behaviour at three years in boys compared with girls (Table 4.2). It is possible that boys' increased behavioural problems elicit harsher parenting and discipline, a phenomenon that development experts ascribe to the bidirectionality of relationships.[183;296-298] In addition, theories of gender socialisation suggest that from the earliest age parents and other key adults respond

differently to boys and girls, and may feel it is acceptable to discipline boys more harshly than girls as a means of toughening them up for the world.[163] However, this explanation runs counter to the hypothesis that boys' externalising behaviour may be deemed more acceptable than girls and may therefore elicit less harsh discipline.[171] There is also some evidence that boys' reactions to their mothers' harsh punishment may differ from those of girls. Boys have been found to react with more externalising behaviour rather than less, which might create a cycle of punishment and worsening behaviour in boys. Conversely, punishment delivered from mother to daughter has been found to be more likely to have the desired effect of reducing 'naughty' behaviour, and hence may not be required as frequently. This evidence is also complicated by the fact that the gender of the person administering punishment may be important for its effect, with discipline administered by the parent of the same gender as the child thought to be more influential. Fathers' parenting in respect of observed warmth and hostility and self-reported discipline practices was not measured in the MCS, and therefore could not be accounted for in this thesis.

Two further gender effects were found in the moderating roles of the father-son and mother-father relationships in the intact two-parent family sample. There was evidence that the strength of the relationship between maternal psychological distress at nine months and child externalising behaviour at five years in boys varied by the quality of the father-son relationship. In boys with a 'good' father-son relationship, the relationship between maternal psychological distress at nine months and externalising behaviour at five years was significantly weaker than in boys with a 'fair' or 'poor' father-son relationship. For girls, there was no moderating effect by father-daughter relationship quality in the association between mother's psychological distress at nine months and externalising behaviour at five years.

Similarly, a significant moderating effect was found in the relationship between maternal psychological distress at three years and boys' externalising behaviour at five years by mother-father relationship quality tertile. For boys, living in the context of a 'good' mother-father relationship quality, rather than a 'fair' or 'poor' one appeared to be protective in the association between maternal psychological distress at three years and boys' externalising behaviour at five years. For girls, the quality of the mother-father relationship did not have a significant moderating effect in the relationship between maternal psychological distress at three years and externalising behaviour at five years. In relation to father-child relationship quality, this evidence is consistent with the theory that the effects of parenting are exacerbated in the case of the same-sex parent.[175] This is also important in respect of the management of boys' externalising behaviour, as it implies that a good father-son relationship may buffer the effects of maternal psychological distress on boys' behaviour. The finding of a protective effect of a 'good' mother-father relationship in the association between maternal psychological distress at three years and boys' externalising behaviour at five years is more difficult to explain. This may imply a resilience effect of a positive family environment on boys' behavioural adjustment. Alternatively, the effect of a good mother-father relationship quality may operate through the mother, who will be less likely to be psychological distressed or to report her child's behaviour as difficult.

The analyses were conducted on the sample stratified by family structure because it was thought there might be different effects in respect of parenting and emotional support for single mothers. Indeed, the distribution of parenting behaviours among the single mothers revealed a picture of less warm, more conflicting relationships with their child than was the case with coupled mothers. Single mothers showed less warmth toward their child and more hostility than coupled mothers, and were

more likely to be observed being hostile towards their child. There are several potential explanations for these differences between single mothers' and coupled mothers' parenting. For example, single mothers in the cohort are younger, and are likely to have less emotional support than coupled mothers. In addition, single mothers are more likely to be socio-economically disadvantaged than coupled mothers and along with this they may also live in more stressful home and neighbourhood environments characterised by living in local-authority rental housing on low incomes. Combined with higher levels of psychological distress, this may result in the harsher parenting and decreased warmth shown towards their children.[119-121] The thesis explored the effect of emotional support, which was hypothesised as moderating the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years. No evidence of this effect was found in single-mother or two-parent families. This may have been a result of the poor measure of emotional support available in the MCS, which used only a single-item question and therefore may not have effectively measured this complex phenomenon.

The thesis aimed to test the extent to which the maternal parenting behaviours mediated the relationship between maternal psychological distress at nine months and three years and child externalising behaviour at five years, and to test potential differences by gender and family structure. From the analyses it has emerged that mother-child relationship quality was the only maternal parenting behaviour which clearly operated as a mediator between maternal psychological distress at nine months and three years and child externalising behaviour at five years, in boys and girls and in two-parent and single-mother families. Evidence for the single-mother families, however, was less clear, and this may be because of the relatively small sample of single mothers, which may have had insufficient power to detect

significant effects. Harsh parenting, including observed maternal hostility and shouting at the child, were found to be independently associated with child externalising behaviour at five years in boys and girls and two-parent families.

The next and final chapter of this thesis presents a discussion of the thesis's main findings, strengths and limitations, and ends with some conclusions and recommendations for future research and societal and policy implications.

Chapter 7: Discussion, conclusions and recommendations

This final chapter of the thesis draws together its main findings and examines them in light of the existing evidence and current policy and practice. The aim is to identify what this thesis adds to our knowledge and understanding of the relationship between maternal psychological distress and child externalising behaviour throughout the early lifecourse. Following a discussion of main findings, the methodological strengths and limitations of the thesis are examined. The thesis ends with conclusions and recommendations for future research, and highlights potential societal and policy implications of the findings.

7.1 Discussion of main findings

7.1.1 A lifecourse perspective

The thesis found evidence consistent with previous research of an association between maternal psychological distress and child externalising behaviour throughout the early lifecourse.[71;93;103;105;143] It also contributes to this body of research by testing this association longitudinally, between maternal psychological distress symptoms at two early-life time points, nine months and three years, and child externalising behaviour symptoms at five years. The thesis tested for the specific lifecourse effects of sensitive period and accumulation by comparing the effects of exposure to high maternal psychological distress at one time point with the other time point, and comparing both time points compared with one or none. Potential gender differences in lifecourse effects were explored. Evidence was found of a more sensitive period in girls for exposure to high maternal psychological distress at three years than at nine months, which was associated with a twofold

increase in externalising behaviour symptoms at five years after adjusting for family structure, birthweight, child's age, mother's age at birth, age squared and birth order. For boys a different lifecourse effect was found, with exposure to high maternal psychological distress at either nine months or three years being associated with a similar degree of increase in externalising behaviour symptoms at five years. These results are partly consistent with evidence that has found that exposure to high maternal psychological distress is associated with a greater increase in child externalising behaviour symptoms in early childhood (sensitive period) in boys and in later childhood and adolescence in girls,[88;93] although the lifecourse period examined in the thesis was much shorter and earlier than that in other studies. Nevertheless, this finding may have implications in respect of differences in the timing of interventions to support psychologically distressed mothers of boys and girls. The cumulative lifecourse effects of high maternal psychological distress, defined as exposure to high maternal psychological distress at both nine months and three years, were tested. Cumulative exposure to high maternal psychological distress was found to have the largest effect on later externalising behaviour symptoms at five years in both boys and girls, compared with exposure at only one time point or at none. Again, this finding may have implications for interventions to support chronically psychologically distressed mothers of young boys and girls. Biological plausibility arguments for lifecourse effects have emerged, but they are largely speculative, as on the whole they extrapolate from animal studies. Neurobiological researchers have hypothesised that the timing and duration of stressors, such as exposure to maternal psychological distress, might operate to affect child socio-emotional behaviour through their influence on long-term hypothalamic-pituitary-adrenal (HPA) functioning.[92] In animal studies researchers have found that the timing and intensity of exposure to adversity can critically influence the eventual outcome. For example,

in a study of rats subjected to post-natal separation for 24hrs, at day three to four the rats exhibited an enhanced adrenocorticotropic hormone (ACTH) response to stressors, while at day 10–12 they showed a reduced ACTH response to stress.[299] ACTH is an important component of the HPA axis. Of course, extrapolating from animal studies offers a weak plausibility argument, and further research is needed to explore and test potential biological and social explanations of the lifecourse effects of exposure to maternal psychological distress and other stressors in the pathway to child outcomes. The thesis offers evidence to suggest that gender comparisons may be of importance to the progress of this body of research.

7.1.2 The role of gender

Although there is robust evidence of significant differences in the prevalence of child externalising behaviour by gender,[23;26] there are few studies which have examined gender differences in the association between maternal psychological distress and child externalising behaviour. Of those which have done so, results are mixed: some have found a stronger effect of maternal psychological distress on boys' externalising behaviour,[87] while others have found a stronger effect on girls' externalising behaviour.[88] This thesis has contributed to this body of research by testing for a potential moderating effect of gender in the association between maternal psychological distress symptoms at nine months and three years and child externalising behaviour symptoms at age five. Evidence was found of effect modification by gender, with a stronger association in boys than in girls. This adds to the evidence which has found a stronger effect of maternal psychological distress on boys' externalising behaviour, and is consistent with findings from a recent study using the MCS, which found a similarly stronger effect of both maternal and paternal psychological distress on teacher-reported socio-emotional adjustment at five

years.[241] Interestingly, the thesis used a different measure of child externalising behaviour at five years, although the similarity to the findings of the study using a measure of child adjustment adds weight to the findings of this thesis. Both studies focused on child socio-emotional behaviour outcomes at five years, and it may be that this gender modification is specific to the infancy period, to child socio-emotional development, or indeed to this sample of mothers and children. Further research is needed, to explore the potential gender differences in the association between maternal psychological distress symptoms and child externalising behaviour symptoms in middle and later childhood and using other data sources.

Biological and sociological plausibility arguments for a gender difference in externalising behaviour, and in the association between maternal psychological distress and externalising behaviour, are found in biology extrapolating from adult studies, and in sociology largely emanating from social learning theory. Firstly, biological arguments have emerged from evidence of the role of the autonomic nervous system, in particular the HPA axis in men and women, which have found male responses to stress to be differentiated from those of females by greater increases in cortisol.[300;301] The greater increases in cortisol found in male stress responses may offer an explanation for gender differences in child externalising behaviour.[92] Few studies have looked at cortisol responses in children, and those which have done so have been conducted on small samples of children and without gender stratification.[302] One exception, although still a very small study of newborns (n=18 male, n=18 female neonates), aimed to identify whether a phenotypic sex difference in stress reaction existed prior to extensive socialisation.[303] The researchers found a number of distinguishing differences in stress response by gender, including a higher cortisol response in male neonates than females. They concluded this indicated that sex differences in behavioural and physiological stress

reactivity existed prior to socialisation. Although a promising and important study, this evidence should be viewed with caution because of the very small sample of boys and girls in the study; however, this does support evidence from adult studies of a biological gender difference in stress response. Historically preceding biological plausibility augments are a number of psychosocial theories offering possible explanations for gender differences in child externalising behaviour. These include gender differences resulting from social learning processes in the home,[304] and modelling behaviour such as same-sex imitation.[305] Social learning theory has been the dominant theory used to explain child externalising behaviour problems over the past four decades.[306] Fundamentally it is based on the theory of operant behaviourism and the principle that if a child receives an immediate reward for behaviour, such as parental attention, they are more likely to repeat the behaviour, and conversely that if behaviour is ignored or punished it is less likely to be repeated. Modelling is a key process in this theory, whereby parents model behaviour, such as aggression or antisocial behaviour, which is repeated by the child.[94] In addition, family processes can act as reinforcement traps: for example, a request from a parent results in an aggressive act from the child, and the parent backs off. Here the child learns to be aggressive to avoid things they do not want to do. The majority of parenting interventions and programmes are based on the principles of social learning theory, and aim to change parenting behaviour in order to diminish unwanted behaviour and reward and encourage wanted behaviour. This socialisation process is obviously closely associated with parenting and the family context in which the child lives, and is discussed further in the next section on the aspect of the FSM pathway which is focused on parenting and family relationships.

7.1.3 The family stress model: pathways and contexts

Socio-economic position

The FSM has informed the thesis, and describes a pathway to poorer child behavioural outcomes triggered by socio-economic hardship and pressure which lead to parental psychological distress, partner relationship conflict, harsher, less sensitive parenting, and consequent child outcomes.[80;113-115] The thesis aimed to add to this body of research by exploring the potential effect of a number of different SEP markers on maternal psychological distress and consequent child externalising behaviour. Extrapolating from studies which have found that the effects of stressors on boys' and girls' externalising behaviour may vary depending on the type of stressor,[32;159;164-166] gender differences were tested for the effects of socio-economic position.[132] The thesis found evidence that self-rated financial status largely operated through maternal psychological distress to influence child externalising behaviour outcomes. In boys and girls and two-parent families, the effects of family income appeared to operate through self-rated financial status in this pathway. This evidence supports the FSM, which proposes that family income influences maternal psychological distress largely through the financial pressure it exerts on the family.[119-121] Indeed, subjective measures of hardship such as worries about debt are thought to tap into psychosocial aspects of deprivation, which may not be reflected in more objective measures such as income.[153] Maternal educational level and housing tenure were both independently associated with child externalising behaviour in boys and girls and two-parent families. The FSM pathway was not supported as clearly for single-mother families. In single-mother families, income, rather than self-reported financial status, appeared to operate through maternal psychological distress to influence child externalising behaviour, although not in the expected direction. Evidence was found of a protective effect of lower income on

child externalising behaviour outcomes in single-mother families, although this effect did not remain after controlling for potential confounding variables. In the single-mother families, educational qualifications were important, and having no qualifications was the only socio-economic position indicator independently associated with child externalising behaviour at five years after adjustment for the covariates. Caution is required in the interpretation of the results for the single-mother sample, however, as the size of the sample was much smaller than the other samples of boys, girls and two-parent families, and it therefore may have lacked sufficient power to detect important associations and relationships.

The potential moderating effect of socio-economic position indicators in the association between maternal psychological distress and child externalising behaviour were tested. A stronger relationship between maternal psychological distress at nine months and boys' externalising behaviour at five years was found in families living below the median poverty line. This is consistent with evidence that has found that the FSM better explains the association between maternal psychological distress and child externalising behaviour in the context of poverty.[130] In the thesis this effect was found only in the families of boys, and only for the association between maternal psychological distress at nine months and boys' externalising behaviour at five years. It may be that in the previous study mentioned above, which looked at all children and did not stratify by gender, the significant results were driven by the boys in the sample. As argued in previous sections, different stressors may differentially affect boys and girls. In the thesis evidence was found of a detrimental effect of high maternal psychological distress at nine months on boys, equal to the effect of exposure at three years, whereas in girls exposure at nine months had considerably less of an effect on later externalising behaviour. It is possible that the period of nine months signifies a particularly sensitive time for

boys' socio-emotional development, when stressors such as maternal psychological distress and poverty have more of a negative influence in respect to later externalising behaviour. Certainly the context of poverty is associated with increased maternal psychological distress, along with more negative family relationships, which in turn are associated with harsher and less sensitive parenting behaviour and poorer outcomes in children. Parenting is another potential mediator in the pathway from SEP to child outcomes, and in the context of the effects of poverty it may offer a plausibility argument for a differential effect by gender. For example, cross–sectional evidence has found parental harshness to have a stronger effect on externalising behaviour in boys than girls.[166;170]

Parenting

Gender and family structure differences in parenting were tested. The analysis found a higher prevalence of harsh parenting of boys than of girls, with significantly more mothers observed being hostile towards their sons than towards daughters, and significantly more mothers reporting smacking their sons 'once a month', 'once a week', or 'daily' and shouting at their sons 'daily' compared with mothers of girls. A number of explanations for this gender difference were proposed. For example, boys had significantly higher levels of externalising behaviour than girls at three years, the same age at which parenting was measured, and this may have elicited harsher parenting and discipline towards the boys.[183;296-298] Gender socialisation processes may also have been in operation: parents may have responded differently to boys and girls by attempting to reinforce culturally defined sex-appropriate behaviour while suppressing behaviours deemed unacceptable.[307] In addition, harsh parenting may be seen as more acceptable towards boys as a means of toughening them up for their role in society. However, in terms of social

learning processes evidence would suggest that although harsher parenting on the one hand may aim to extinguish certain behaviours in children, on the other hand it may model 'aggressive' behaviours to the child and create a cycle of increasing aggression. To compound this, differential effects of parenting by gender have been found. For example, boys have been found to respond more aversely to maternal control, whereas in girls the effect is to reduce aggression.[169] This may also feed into a cycle of harsher punishment and worsening behaviour for boys.[165;166] This raises questions about the most effective way of dealing with boys' externalising behaviour problems. Increasing levels of harsh punishment of boys and withdrawal of warmth may not be the most effective parenting response to reduce undesired externalising behaviour symptoms. It may be that there are other parenting approaches which are more effective for reducing externalising behaviour in male children, particularly if delivered by the mother. More research is required into gender differences in parenting and child responses to parenting behaviours. This is important for practice and policy, as numerous parenting programmes exist, and indeed form part of government programmes to reduce inequalities in health, such as Sure Start Children's Centres and Family Nurse Practitioners. It is vital that parenting programmes continue to adapt to new and robust evidence.

The FSM pathway proposes that maternal psychological distress influences child externalising behaviour through parenting behaviours, and parenting behaviours were investigated as possible mediators in the association between maternal psychological distress at nine months and three years and externalising behaviour at five years. The thesis found evidence of a mediating role for parenting across the stratified sample of boys and girls and two-parent and single-mother families. As hypothesised, mother-child relationship quality was the strongest mediator in this pathway in boys and girls in the two-parent families. This is consistent with research

that has found the quality of the parent-child relationship to have the strongest association with behavioural problems.[70] A proviso to this conclusion is that the mother-child relationship quality measure used in the MCS is a much more refined measure than those used for harsh discipline, maternal warmth and hostility, shouting at and smacking the child, which were all single-item measures. Previous research has found the parent-child relationship to be of greater importance in the relationship between maternal psychological distress and child externalising behaviour in single-mother families than in two-parent families.[143] The thesis did not find evidence of this, and indeed the results for single-mother families were less clear; this may be explained by the relatively small sample of single mothers, which may have had insufficient power to show significant effects.

The potential moderating effect of family structure on the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years was tested. This was potentially important to this thesis, as previous research had found socio-economic disadvantage, and consequently psychological distress, to disproportionately affect single mothers compared with coupled mothers.[133;141;142] Comparing single mothers and coupled mothers revealed a picture of increased socio-economic disadvantage in single mothers, as expected. This appeared to impact on maternal psychological distress, which was significantly higher in single mothers than in coupled mothers, and is known to be associated with harsher, less sensitive parenting. Socio-economic disadvantage has also been found to impact directly on parenting practices through the effect of the availability of financial resources on single mothers' childrearing efficacy beliefs, which affect parenting practices indirectly through parents' development goals for their children.[308] In brief, when financial resources are unavailable, single mothers downgrade their aspirations for their children, and this is

reflected in the mother's belief in her ability as a parent, as well as in her parenting practices. Indeed, the thesis found single mothers had a lower quality mother-child relationship, characterised by less warmth and more conflict. This combination of low warmth and increased hostility has been found to be a stronger predictor of externalising behaviour in infant boys than in girls.[167] Despite this, no evidence was found of a moderating effect in the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years by family structure. Indeed, research which has explored family structure differences in the association between socio-economic disadvantage, maternal psychological distress and consequent child behavioural outcomes has concluded that the differences in child outcomes can be accounted for by socio-economic disadvantage.[143]

Fathers and family relationships

The thesis aimed to contribute to the small but growing body of evidence exploring the role of fathers in child health and developmental outcomes. Evidence was found of a moderating effect of the quality of the father-son relationship in the association between maternal psychological distress at nine months and child externalising behaviour at five years, with the association being weakest in boys with a 'good' father-son relationship, and of equal strength in boys with a 'fair' or 'poor' father-son relationship. A 'good' father-son relationship was characterised by high levels of perceived openness and low levels of conflict. A moderating effect in the association between maternal psychological distress at nine months and girls' externalising behaviour at five years of the quality of the father-daughter relationship was not found. This result was not consistent with previous research which tested the moderating effect of the father-child relationship in a subsample of MCS intact

families and found no evidence of a buffering effect in the association between high maternal psychological distress at nine months and child total difficulties or either of the four Strengths and Difficulties Questionnaire (SDQ) behaviour subscales.[172] This may be because the latter study did not test this effect by the gender of the child. In addition, it may be specific to the externalising behaviour outcome, which combines two of the SDQ subscales of conduct and hyperactivity. Evidence of effect modification in the association between maternal psychological distress at nine months and child externalising behaviour at five years by father-child relationship quality in boys is consistent with the theory that the effects of parenting are exacerbated if delivered by a same-sex parent.[175] For example, father negativity has been identified as a risk factor for boys' conduct problems in the home, but not for girls'.[166]

Lastly, the moderating effect of mother-father relationship quality in the association between maternal psychological distress at nine months and three years and child externalising behaviour at five years was tested. A significant moderating effect of mother-father relationship quality was found in the relationship between maternal psychological distress at three years and boys' externalising behaviour at five years. The evidence suggested that the context of a 'good' mother-father relationship was protective against the association between maternal psychological distress at three years and boys' externalising behaviour at five years. For girls the mother-father relationship quality did not appear to have a significant moderating effect on the relationship between maternal psychological distress at three years and externalising behaviour at five years. This finding is consistent with evidence that a warm mother-father relationship can attenuate the relationship between post-natal depression and infant distress, while a relationship of conflict can exacerbate this relationship.[154] This gender difference in the moderating effect of the mother-father

relationship in the association between maternal psychological distress and child externalising behaviour has not been found before, and warrants further investigation.

7.2 Strengths and limitations of the thesis

7.2.1 Originality

When the subject of this thesis was conceived in late 2008, there was one published study exploring the association between maternal psychological distress at nine months only and child externalising behaviour at three years using the MCS.[143] The thesis was informed by this study, which highlighted the need for further research in this area to take account of the child's gender, family structure, parenting, emotional support and partner relationship quality, and the study aimed to respond to these gaps.

7.2.2 Methodological approach

The methodological approach for this study emanates from the discipline of social epidemiology. Social epidemiology explicitly studies relations between social factors and 'disease'.[309] The tension in social epidemiological research, exemplified by its methods and theories, largely emanates from the convergence of biological and social determinism, and this is acknowledged as a key challenge.[109] This is the case in this thesis, which uses epidemiological methods to explore the association between phenomena that are normally the remit of the medical profession – maternal and child mental health – while focusing on the social determinants of the association between them. Epidemiology has proved useful for investigating the

social determinants of health, particularly in relation to understanding cause and aetiology. Another key social epidemiological concept which has developed alongside the birth cohort studies in the UK is the lifecourse approach. This approach seeks to take account of the temporal, dynamic effects of social exposures over a lifetime rather than the simple cross-sectional association often modelled,[102] and this approach has also informed this study.

7.2.3 Theoretical approach

Epidemiologists have criticised a purely statistically driven approach to epidemiological research, and instead advocate theoretically driven analysis in particular to promote the meaningful interpretation of results.[280;310] It was the aim of this study to take a theoretically driven approach, and to this effect this study is informed by three key theoretical models: Bronfenbrenner's bio-ecological systems theory, the lifecourse approach, and the family stress model.[73;97;116;279] It is hoped that using a theoretically informed approach enhances the thesis through a more meaningful interpretation of results. In addition, the choice of theories to contextualise the relationship between maternal psychological distress and child externalising behaviour within the wider socio-economic environment aims to alleviate the conceptual tension caused by examining the component parts of the proposed pathways and mechanisms as separate items. Any theory or model, however, is of course limited, as it will try to illustrate or explain complex multidimensional, dynamic processes in a simplistic and often two-dimensional way. Some of the criticisms of the three theories used are highlighted in chapter one.

7.2.4 The MCS dataset

A strength of this study is the use of the MCS dataset. This is an extremely rich source of data, and therefore did not overly restrict the scope of the hypotheses to be tested. The very early years of life and the origins of child externalising behaviour, including the intergenerational effects of maternal mental health, require a complex cohort study to enable the examination of the effects of various factors in a naturalistic environment. The MCS gives the opportunity to do such research.

An observational cohort study, of which the MCS is one, identifies a group of individuals and observes them across time to see what events/diseases befall them. A defining feature of a cohort study is the element of time, which in cohort studies is prospective, i.e. individuals are identified at one time point and followed up to another, later time point. Some key elements of cohort studies relate to the group being studied and the measures taken at baseline and at each follow-up wave. In order to interpret the findings correctly, one needs to have a clear idea of whom the cohort represents. This is important as it informs the extent to which the findings can be generalised to other similar populations. The MCS was designed as a representative cohort of families of children in England, Wales, Scotland and Northern Ireland, and hence the findings of this study aim to be generalisable to this population. In the MCS, sampling weights are devised after each new wave of data collection, which can be applied to the analysis and which aim to take account of changes in the sample as a result of dropout. These weights were used throughout the analysis in this thesis as a means to ensure the results were generalisable to the UK population.

Another important feature of cohort studies is that they collect the same data from all cohort participants, regardless of their individual ‘issues’. This is a strength of the

cohort study, as it allows for naturalistic case-control comparison. However, it is also a potential weakness, as the number of measures has to be restricted so as not to cause extensive inconvenience to the participants who might drop out of the study if interviews and examinations are too onerous. In the MCS the parent-child relationship quality was only measured at wave 2, and this restricted the study to the examination of the effects of parenting at this wave only. This also restricted the methods of analysis which could be used, as some advanced longitudinal methods require repeated measures across time.

A problem which faces cohort researchers is whether to change measures from wave to wave. Changing measures from one wave to another can cause problems for researchers, as they may not be able to compare phenomena across different time points. This situation occurred in the MCS with the measure of psychological distress, which was changed between waves 1 and 2 of the study. This proved to be a limitation of this study, as comparison between the two early time points was disrupted.

7.2.5 Sources of bias

Study attrition

It is the aim of cohort study researchers, once they have secured a representative sample of individuals, to keep as many of the original sample as possible for the longest time possible. Inevitably people drop out or are lost to follow-up, and these people often differ systematically from those who stay in the study, which can be a source of bias. As mentioned previously, in the MCS, cohort weights are devised

after each wave to account for attrition. These weights were applied to the analyses in this thesis.

Random error

One way to decrease random error is to ensure an adequate sample size. This study, despite reductions in the sample size due to item non-response, has a large sample size of n=6,503. This is a much larger sample than in many previous studies exploring the relationship between maternal psychological distress and child externalising behaviour, and therefore the thesis contributes to this field of research in this respect.

Missing data

In the study a complete-case analysis approach to missing data was taken, which resulted in a smaller available sample; it also ran the risk of introducing bias into the sample, because participants who do not complete information may be different from those for whom complete data are available. Although this approach to missing data is frequently used, there are alternative approaches to dealing with missing data and item non-response, such as multiple imputation modelling. Using multiple imputations would have increased the available sample size and hence increased the study's power to detect significant effects. However, the thesis did use sensitivity analysis as a means of checking the robustness of findings. In this study a larger sensitivity sample was used where possible, and key analysis was repeated using this sample. In addition, when a larger sample was not available, alternative derivations of the measures were used to test results. Results of sensitivity analyses were similar to those using the complete case sample and offer reassurance for the representativeness of the study sample.

Information bias

Information bias occurs when there are systematic errors in the way information is collected. As mentioned previously, the SDQ measure was completed by the main respondent, which in the case of this thesis was the biological/birth mother. The use of the SDQ measure completed by one informant has been criticised on the grounds of subjectivity. For instance, the measure may be affected by the person's perceptions, cultural and societal norms, or mental health. This criticism is particularly pertinent to the thesis, which looks at the relationship between maternal psychological distress and child externalising behaviour. For example, mothers with depression have been found to hold a more negative view of their infants than independent observers, and this in turn may influence the likelihood that they will report their child's symptoms more negatively.[311;312] Some evidence suggests there may be concurrent depression-related distortion in a mother's perception of her child's behaviour, although the evidence of distortion is mixed.[312;313] Two recent studies which have looked at the relationship between mothers' depression and child socio-emotional adjustment using the MCS data have attempted to overcome this potential depression-distortion effect by using data for the exposure and outcome at different time points.[71;143] This approach was also adopted in this thesis to take some account of the possible biasing effect of concurrent maternal psychological distress on mothers' reports of their children's behaviour.

As mentioned previously, the maternal psychological distress measure was changed between wave 1 and wave 2 of the MCS, limiting the comparability of the results in this study. Changes to important measures can be particularly harmful to research in the early phases of a child cohort study, because children are developing rapidly, and because there are a limited number of waves of data to analyse. Different ways of dealing with this limitation in the thesis were considered. The option of

standardising the wave 1 and 2 psychological distress measures was considered; however, no adequate method to improve comparability was found. Nevertheless, both measures have been shown to reflect the same psychological difficulties, such as anxiety and depression, commonly experienced in community samples.[63;220;226;314] In order to test the lifecourse hypotheses, which required overt comparison across the waves, a binary measure of psychological distress was derived to indicate mothers with 'high' levels of distress and representing the top deciles of the sample at nine months and three years. A variable was then derived from these binary measures, grouped into mothers with no high distress at nine months or three years, mothers with high distress at nine months only, mothers with high distress at three years only, and mothers with high distress at both nine months and three years. This approach has been used elsewhere, although with slightly different cut points.[71] Both the Rutter Malaise Inventory and the K6 claim to identify mothers who are more likely to have depression in the upper deciles of the score, and hence this approach was taken.

The measures used for mothers' psychological distress and child externalising behaviour were both used as continuous scores. The use of the rating scales as continuous measures had theoretical and methodological purpose. Theoretically, a sociological model of mental health informed the study, and this was in contrast to the dominant medical model, which focuses on identifying 'disorders'. In addition, symptoms of depression or anxiety, even if experienced at relatively low levels, may still influence child outcomes via pathways such as the quality of the mother-child or mother-father relationship. Using the main outcome and exposure as continuous measures also allowed the investigation of a gradient pattern in the relationships. In this way it was possible to identify whether any relationship showed a dose-response pattern. It was an important objective of this research to examine the

possible effects of mother's psychological distress across different levels of symptomology, not least because a dose-response relationship would add support to a causation argument.[287] In addition, the use of the SDQ externalising behaviour scale as a continuous measure was partly in response to recent evidence that has confirmed the dimensionality of the externalising behaviour scale in a large community sample of British children aged five to 16 years.[47] One possible limitation of using the psychological distress symptom scale, as opposed to a dichotomised variable identifying mothers with likely 'clinical' levels of psychological distress (depression and anxiety), may be that children of mothers with clinical levels of psychological distress differ systematically from children of mothers with subclinical levels of psychological distress, for example in respect of genetic risk. There is some evidence from early adult twin studies that up to 79% of the variance in adult depression may be accounted for by genetic effects when a narrowly defined clinically significant depression diagnosis is used.[315] More recent genome-wide association studies, however, have concluded that the extant evidence must be treated cautiously, as much larger studies are required to more fully understand the aetiology of depression.[316]

Confounding

In observational studies such as the MCS, the control of confounding effects is a key priority of the analysis.[317] This is because the individuals in the cohort are not specifically chosen for their characteristics, and hence may differ substantially from each other. In order to investigate the influence of one factor on an outcome, it is therefore necessary to control for aspects of the individual or environment that are known to be associated with both the outcome and the exposure. Of course, this requires that the potential confounding factors are measured, and measured at the

appropriate time point. On the whole the Millennium Cohort Study proved to be a very rich source of data, and many of the a priori identified covariates were available in the data set. This adds weight to the robustness of the study findings, and in addition improves on previous research, which has not accounted for important factors such as child temperament, post-natal attachment and emotional support. This does not eliminate the possibility of residual confounding biasing the results; however, it may be less of a problem than in previous research.

One variable excluded from the study was ethnicity, although this was by design. Some researchers have proposed that there may be ethnic differences in the FSM pathway.[318;319] It could be argued, however, that potential ethnic differences can be largely explained by other factors, such as socio-economic disadvantage, lone parenthood or marital conflict, rather than specific cultural factors. Indeed, the tendency in some research to assign an explanation for ethnic differences in health to generalised 'cultural' factors has been criticised, and an approach which rather explicitly tests for factors believed to be associated with cultural or ethnic differences, such as socio-economic position, is supported.[320] If this approach is used, as in this study, it should be noted that commonly used measures of socio-economic circumstance such as family income have been criticised as not adequately capturing socio-economic differences across ethnic groups, and therefore some thought is required on how best to measure socio-economic experiences across ethnic groups.[320] To this end a number of socio-economic position measures were used in this thesis, including housing tenure and overcrowding, which are recommended when taking account of ethnic differences in socio-economic position.

7.3 Conclusions and recommendations

7.3.1 Future research

The thesis found a stronger association between maternal psychological distress at nine months and three years and boys' externalising behaviour at five years, and this would benefit from further research and verification. Replication using different cohorts of children and families and in older-age children would contribute to this area of research. However, in light of this finding and a similar finding in a study using a different measure of socio-emotional development, further research examining child socio-emotional behavioural outcomes in early life would do well to test for a gender interaction or to stratify analyses by gender.

Two key theories offer some speculative evidence to explain the gender interaction found in this relationship. One comes from the field of neurobiology and pertains to gender differences in cortisol responses, and the other comes from the psychosocial theories of social learning[304] and modelling behaviour, in particular same-sex imitation.[305] Arguments of biological plausibility to explain differences in child externalising behaviour by gender have extrapolated evidence from animal and adult studies. Caution is required in adopting these explanations of child gender differences in response to stressors, and research is needed into potential biological explanations of gender differences in child externalising behaviour. Cortisol responses to stress offer a promising direction for this research. The theory of social learning is an important field of research, not least because the majority of parent training programmes use social learning theory as their evidence base. This thesis has raised questions about potential gender differences in externalising behaviour, in particular in association with evidence of the differential effects of parenting. Harsher discipline and reduced warmth in response to externalising behaviour

problems may be counterproductive for reducing such behaviours in boys. It was proposed that different parenting approaches may be more effective for reducing externalising behaviour in male children than in female children, particularly if delivered by the mother. Further research is required into gender differences in parenting and child responses to parenting behaviours.

The thesis found evidence of lifecourse effects in the association between high maternal psychological distress and child externalising behaviour. Comparison of the sensitive-period effect by gender found that exposure to high maternal psychological distress at nine months compared with at three years was associated with an equal effect on boys' externalising behaviour at five years, and had a stronger effect at three years on girls' externalising behaviour at five years. This may have implications for the timing of preventative measures for child behavioural problems, which may be more effective in the early months for boys. The picture was more complex however, as cumulative effects of exposure to high maternal psychological distress at both nine months and three years were found to have the greatest overall effect on externalising behaviour at five years in both boys and girls. Therefore the identification and reduction of maternal psychological distress throughout early motherhood may be an effective preventive tool. This evidence of lifecourse effects found in this thesis may be important, but should be viewed with some caution because of the use of different measures of psychological distress at waves 1 and 2 of the MCS. Further research is required into lifecourse effects in this association, using comparable measures for both maternal psychological distress and child externalising behaviour and testing for gender differences. Testing sensitive period and accumulation models separately, as in this thesis, suggests an either-or scenario, whereas it is more likely that lifecourse models work in conjunction with each other. Other researchers have recommended comparing sets

of nested models, with each corresponding to a different lifecourse model such as accumulation and sensitive period, with an all-inclusive (saturated) model,[321] in order to provide a clearer understanding of the relative merits of the alternative hypotheses. Future research might attempt to use this approach.

Evidence of the importance of the father-child and father-mother relationships in ameliorating the negative effects of maternal psychological distress on externalising behaviour in boys requires that further research incorporating fathers as well as mothers be conducted. This may be of particular importance in the early years, as boys appear to be more affected by socio-economic disadvantage and maternal psychological distress than girls, in particular in the first year of life.

The approach used to handle missing data in this thesis, although commonly used, can be criticised as potentially reducing the representativeness of the sample, and also as reducing the size of the available sample and hence reducing the potential statistical power to identify effects. It is recommended that multiple imputation models be computed and used to rerun this analysis, to compare results and boost the robustness of the thesis findings.

7.3.2 Societal and policy implications

In light of the worrying projections of rising rates of depression globally,[19;20;322] which appear to disproportionately affect women during the period of motherhood, and of the importance of the early years of life as the foundation for healthy development and later life outcomes,[36;38;39;41] the association between maternal psychological distress and child externalising behaviour demands to be kept on the research and policy agenda in the UK and internationally.

In the UK, the Sure Start programme was set up as part of the government's commitment to enhance the life prospects of children under four years old growing up in disadvantaged families.[37;40] The findings of this thesis, of a dose-response association between socio-economic position and maternal psychological distress and child externalising behaviour, fits with those of other studies which have found a social gradient in psychosocial child development outcomes.[138] The implications of this finding challenge a targeted intervention approach whereby the most disadvantaged families, or mothers with diagnosed depression only, are identified as 'at risk' and hence eligible for intervention. In fact, it has been argued by proponents of the social gradient in health that action must be universal to reduce the steepness of the social gradient in health, 'but with a scale and intensity that is proportionate to the level of disadvantage', an approach known as proportional universalism.[41] This is important for practice and policy, as numerous targeted parenting programmes exist and form part of government programmes to reduce inequalities in health such as Sure Start Children's Centres and Family Nurse Practitioners.

Two key modifiable factors in the association between maternal psychological distress and child externalising behaviour have been highlighted in this thesis; parenting and socio-economic position. There has been a relatively recent upsurge in research focused on parenting, and this has been helpful in broadening our understanding of the dimensions of parenting and the potential pathways and mechanisms that are important to child outcomes. This surge of research interest in parenting in the UK has been partly a result of the previous Labour government's prioritisation of early years programmes and policy, including the National Academy of Parenting Practitioners, which has since been closed and its research arm relocated to King's College, London. Critics of this new 'parenting science' focus their dissent on its promotion of the individualisation of responsibility for a child's

care and its consequent focus on the parent-child dyad.[323] This focus on the parent, and in particular on the mother, lays the blame for our 'broken society' in the lap of parents, while potentially absolving the state of responsibility to address the root causes of poor child outcomes, such as poverty and social inequality. These are arguably the structural drivers of the broader family milieu. This thesis has shown that socio-economic disadvantage, in particular economic pressure, appears to operate through its impact on maternal psychological distress, and consequently on parenting, to influence child behavioural outcomes. A focus on parenting, although potentially helpful for parents if it results in good-quality interventions and support, may therefore not be addressing the root causes of maternal psychological distress and poorer child outcomes. There is certainly evidence that improvements in family economic circumstances, such as reduced unemployment and poverty and increased income, can have positive impacts on mother and child outcomes such as reductions in mothers' depressive symptoms,[324] social behaviour, school achievement and motivation[325] and lead to reductions in child psychiatric symptoms of conduct and oppositional defiant disorder.[326] Interestingly, some of these improvements in child outcomes following improvements in family economic circumstances have been found primarily in boys.[325] As evidence suggests that interventions to reduce family poverty and financial pressure can have benefits for children, a stronger focus on reducing economic hardship as a means of improving families' lives and children's development and later-life outcomes is paramount. This is particularly so in light of the current world economic crisis and the increasing economic pressure this inevitably puts on families. A recent independent review of the most effective evidence-based strategies for reducing health inequalities in England concluded with six policy objectives, the first being to 'give every child the best start in life'.[41] Achieving this goal may require difficult policy decisions and a renewed commitment to reduce child poverty; however, any short-term costs are

likely to pale in the light of the long-term benefits to children, families and society as a whole.

This thesis aimed to add to the evidence of a relationship between maternal psychological distress and child externalising behaviour by examining the less well researched pathways and contexts involved, as well as how these may differ by gender or family structure. Epidemiological methods were used to investigate this relationship which involved focusing in on the different components and pathways. This approach may be criticised for its deconstruction of the relationship, however it allowed for the in-depth examination of several potential pathways and contexts. The theory driven approach ensured that the interpretation of findings reflected the relationship between maternal psychological distress and child externalising behaviour as a whole, as well as accounting for the multilayered context in which it occurs. The thesis has highlighted new and important findings related to the association between maternal psychological distress and child externalising behaviour across the early lifecourse.

References

(1) Hann DM. Taking stock of risk factors for child/youth externalizing behavior problems. 2001. Rockville, MD, National Institute of Mental Health (NIMH).

(2) Richards M, Abbott R, with Collis G, Hackett P, Hotopf M, Kuh D et al. Childhood mental health and life chances in post-war Britain: insights from three national birth cohort studies. 2010. UK, The Smith Institute, Sainsbury Centre for Mental Health, Medical Research Council (MRC), Unison.

(3) Goodman SH, Gotlib IH. Introduction. In: Goodman SH, Gotlib IH, editors. Children of depressed parents: mechanisms of risk and implications for treatment. 2002. Washington DC, American Psychological Association; 3–9.

(4) Kim-Cohen J, Caspi A, Moffitt TE, Harrington H, Milne BJ, Poulton R. Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective-longitudinal cohort. *Archives of General Psychiatry* 2003; 60(7):709–717.

(5) McGee TR, Hayatbakhsh MR, Bor W, Cerruto M, Dean A, Alati R et al. Antisocial behaviour across the life course: an examination of the effects of early onset desistence and early onset persistent antisocial behaviour in adulthood. *Australian Journal of Psychology* 2011; 63(1):44–55.

(6) WHO. The World Health Report 2005: make every mother and child count. 2005. Geneva, Switzerland, World Health Organization.

(7) Canino GJ, Bird HR, Rubio-Stipec M, Bravo M, Alegria M. Children of parents with psychiatric disorder in the community. *American Academy of Child and Adolescent Psychiatry* 1990; 29(3):398–406.

(8) Federenko IS, Wadhwa PD. Women's mental health during pregnancy influences fetal and infant developmental and health outcomes. *Cns Spectrums* 2004; 9(3):198–206.

(9) Goodman SH, Gotlib IH. Risk for psychopathology in the children of depressed mothers: a developmental model for understanding mechanisms of transmission. *Psychological Review* 1999; 106(3):458–490.

(10) Herring S, Gray K, Taffe J, Tonge B, Sweeney D, Einfeld S. Behaviour and emotional problems in toddlers with pervasive developmental disorders and developmental delay: associations with parental mental health and family functioning. *Journal of Intellectual Disability Research* 2006; 50(6):874–882.

(11) Leverton TJ. Parental psychiatric illness: the implications for children. *Current Opinion in Psychiatry* 2003; 16:395–402.

(12) Martins C, Gaffan EA. Effects of early maternal depression on patterns of infant-mother attachment: a meta-analytic investigation. *Journal of Child Psychology and Psychiatry* 2000; 41(6):73–746.

(13) Orvaschel H, Weissman MM, Kidd KK. Children and depression: the children of depressed parents; the childhood of depressed patients; depression in children. *Journal of Affective Disorders* 1980; 2(1):1–16.

(14) Vostanis P, Graves A, Meltzer H, Goodman R, Jenkins R, Brugha T. Relationship between parental psychopathology, parenting strategies and child mental health: findings from the GB national study. *Social Psychiatry and Psychiatric Epidemiology* 2006; 41:509–514.

(15) Weissman MM, Paykel ES, Klerman GL. The depressed woman as a mother. *Social Psychiatry* 1972; 7:98–108.

(16) Weissman MM, Wickramaratne P, Nomura Y, Warner V, Pilowsky D, Verdeli H. Offspring of depressed parents: 20 years later. *American Journal of Psychiatry* 2006; 163(6):1001–1008.

(17) Goodman S, Rouse M, Connell A, Broth M, Hall C, Heyward D. Maternal depression and child psychopathology: a meta-analytic review. *Clinical Child and Family Psychology Review* 2011; 14(1):1–27.

(18) Conger RD, Conger KJ, Elder GH, Jr, Lorenz FO, Simons RL, Whitbeck LB. A family process model of economic hardship and adjustment of early adolescent boys. *Child Development* 1992; 63(3):526–541.

(19) Gotlib IH, Hammen CL. Handbook of depression. 2nd ed. 2009. New York, The Guildford Press.

(20) Murray CJL, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *The Lancet* 1997; 349(9063):1436–1442.

(21) WHO. The Global Burden of Disease: 2004 update. 2008. Geneva, Switzerland, World Health Organization.

(22) Berk LE. Child development. 7th ed. 2006. Boston, USA, Pearson Education, Inc.

(23) Meltzer H, Gatward R, Goodman R, Ford T. The mental health of children and adolescents in Great Britain. *International Review of Psychiatry* 2000; 15(1):185–187.

(24) Roberts RE, Attkisson CC, Rosenblatt A. Prevalence of psychopathology among children and adolescents. *American Journal of Psychiatry* 1998; 155(6):715–725.

(25) Goodman R, Scott S. Child psychiatry. 2nd ed. 2005. Oxford, UK, Blackwell Publishing Ltd.

(26) Green H, McGinnity A, Meltzer H, Ford T, Goodman R. Mental health of children and young people in Great Britain, 2004. 2005. London, Palgrave MacMillan.

(27) WHO. The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. 1992. Geneva, World Health Organization.

(28) American Psychological Association. Diagnostic and statistical manual of mental disorders. 4th ed. 1994. Washington DC, American Psychiatric Association.

(29) Waraich P, Goldner EM, Somers JM, Hsu L. Prevalence and incidence studies of mood disorders: a systematic review of the literature. *Canadian Journal of Psychiatry* 2004; 49(2):124–138.

(30) Hinshaw SP. On the distinction between attentional deficits/hyperactivity and conduct problems/aggression in child psychopathology. *Psychological Bulletin* 1987; 101(3):443–463.

(31) Liu J. Childhood externalising behavior: theory and implications. *Journal of Child and Adolescent Psychiatric Nursing* 2004; 17(3):93–103.

(32) Shaw DS, Winslow EB. Precursors and correlates of antisocial behavior from infancy to preschool. In: Stoff DM, Breiling J, Maser JD, eds. Handbook of antisocial behavior. 1997. USA, John Wiley & Sons Inc; 148–158.

(33) Farrington DP. The relationship between low resting heart rate and violence. In: Raine A, Brennan PA, Farrington DP, Mednick SA, eds. Biosocial bases of violence. 1997. New York, Plenum; 89–106.

(34) Monutaeux MC, Faraone SV, Gross LM, Bierderman J. Predictors, clinical characteristics, and outcome of conduct disorder in girls with attention-deficit/hyperactivity disorder: a longitudinal study. *Psychological Medicine* 2007; 37:1731–1741.

(35) Silva PA. The Dunedin Multidisciplinary Health and Development Study: a 15 year longitudinal study. *Paediatric and Perinatal Epidemiology* 2009; 4(1):76–107.

(36) Barker DJ. In utero programming of chronic disease. *Clinical Science* 1998; 95(2):115–128.

(37) Belsky J, Melhuish E, Barnes J. Research and policy in developing an Early Years' Initiative: the case of Sure Start. *International Journal of Child Care and Education Policy* 2008; 2(2):1–13.

(38) Grunewald R, Rolnick A. A productive investment: Early Child Development. In: Eming-Young M, Richardson LM, eds. Early Child Development from measurement to action: a priority for growth and equity. 2007. Washington DC, The International Bank for Reconstruction and Development/The World Bank; 17–32.

(39) Hertzman C. The biological embedding of early experience and its effects on health in adulthood. *Annals of the New York Academy of Sciences* 1999; 896:85–95.

(40) HM Treasury, Department for Children SaF, DWP. Ending child poverty: mapping the route to 2020. 2010. London, Crown Copyright.

(41) Marmot M. Fair society, healthy lives: The Marmot Review. 2010. London, The Marmot Review.

(42) Maniadaki K, Sonuga-Barke E, Kakouros E, Karaba R. AD/HD symptoms and conduct problems: similarities and differences in maternal perceptions. *Journal of Child and Family Studies* 2006; 15(4):460–474.

(43) Taylor E, Chadwick O, Heptinstall E, Danckaerts M. Hyperactivity and conduct problems as risk factors for adolescent development. *Journal of the American Academy of Child and Adolescent Psychiatry* 1996; 35(9):1213–1226.

(44) Campbell SB, Shaw DS, Gilliom M. Early externalizing behaviour problems: toddler and preschoolers at risk for later adjustment. *Development and Psychopathology* 2000; 12:467–488.

(45) Sayal K, Taylor E. Detection of child mental health disorders by general practitioners. *British Journal of General Practice* 2004; 54(502):348–352.

(46) Farrington DP, Loeber R. Some benefits of dichotomization in psychiatric and criminological research. *Criminal Behaviour and Mental Health* 2000; 10(2):100–122.

(47) Goodman A, Lamping DL, Ploubidis GB. When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties Questionnaire (SDQ): data from British parents, teachers and children. *Journal of Abnormal Child Psychology* 2010; 38:1179–1191.

(48) Goodman A, Goodman R. Population mean scores predict child mental disorder rates: validating SDQ prevalence estimators in Britain. *Journal of Child Psychology and Psychiatry* 2011; 52(1):100–108.

(49) WHO. The World Health Report 2001: Mental health: new understanding, new hope. 2001. Geneva, World Health Organization.

(50) Deverill C, King M. Common mental disorders. In: McManus S, Meltzer H, Brugman E, Bebbington P, Jenkins R, eds. Adult psychiatric morbidity in England, 2007: results of a household survey. 2009. Leeds, UK, The NHS Information Centre for Health and Social Care; 25–37.

(51) Singleton N, Bumpstead R, O'Brien M, Lee M, Meltzer H. Psychiatric morbidity among adults living in private households, 2000. 2001. London, The Stationery Office.

(52) Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey replication. *Archives of General Psychiatry* 2005; 62(6):593–602.

(53) Sacker A, Wiggins RD. Age-period-cohort effects on inequalities in psychological distress, 1981–2000. *Psychological Medicine* 2002; 32:977–990.

(54) Bebbington P. The origins of sex differences in depressive disorder: bridging the gap. *International Review of Psychiatry* 1996; 8:295–332.

(55) Nolen-Hoeksema S, Larson J, Grayson C. Explaining the gender difference in depressive symptoms. *Journal of Personality and Social Psychology* 1999; 77(5):1061–1072.

(56) O'Hara MW, Swain AM. Rates and risk of postpartum depression: a meta-analysis. *International Review of Psychiatry* 1996; 8(1):37–54.

(57) O'Hara MW. Postpartum depression: what we know. *Journal of Clinical Psychology* 2009; 65(12):1258–1269.

(58) Meijssen D, Wolf M-J, Koldewijn K, Baar Av, Kok J. Maternal psychological distress in the first two years after very preterm birth and early intervention. *Early Child Development and Care* 2011; 181(1):1–11.

(59) Murray D, Cox JL, Chapman G, Jones P. Childbirth: life event or start of a long-term difficulty? Further data from the Stoke-on-Trent controlled study of postnatal depression. *The British Journal of Psychiatry* 1995; 166(5):595–600.

(60) Thorpe K, Golding J, MacGillivray I, Greenwood R. Comparison of prevalence of depression in mothers of twins and mothers of singletons. *British Medical Journal* 1991; 302(6781):875–878.

(61) Kessler RC, Green JG, Gruber MJ, Sampson NA, Bromet E, Cuitan M et al. Screening for serious mental illness in the general population with the K6 screening scale: results from the WHO World Mental Health (WMH) survey initiative. *International Journal of Methods in Psychiatric Research* 2010; 19(S1):4–22.

(62) Cairney J, Veldhuizen S, Wade TJ, Kurdyak P, Streiner DL. Evaluation of two measures of psychological distress as screeners for depression in the general population. *The Canadian Journal of Psychiatry* 2007; 52(2):111–120.

(63) Kessler RC, Barker PR, Colpe LJ, Epstein JF, Gfroerer JC, Hiripi E et al. Screening for serious mental illness in the general population. *Archives of General Psychiatry* 2003; 60(2):184–189.

(64) Wang PS, Lane M, Olfson M, Pincus HA, Wells KB, Kessler RC. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. *Archives of General Psychiatry* 2005; 62:629–640.

(65) Whiffen VE, Gotlib IH. Comparison of postpartum and nonpostpartum depression: clinical presentation, psychiatric history, and psychosocial functioning. *Journal of Consulting and Clinical Psychology* 1993; 61(3):485–494.

(66) Goodman SH. Depression in mothers. *Annual Review of Clinical Psychology* 2007; 3(1):107–135.

(67) National Research Council and Institute of Medicine. Depression in parents, parenting, and children: opportunities to improve identification, treatment, and prevention. In: England MJ, Sim LJ, eds. Committee on depression, parenting practices, and the healthy development of children. 2009. Washington DC, The National Academies Press.

(68) Cooper PJ, Murray L. Postnatal depression. *British Medical Journal* 1998; 316(7148):1884–1886.

(69) Sinclair D, Murray L. Effects of postnatal depression on children's adjustment to school. Teachers' reports. *The British Journal of Psychiatry* 1998; 172(1):58–63.

(70) Sydsjö G, Wadsby M, Göran Svedin C. Psychosocial risk mothers: early mother-child interaction and behavioural disturbances in children at 8 years of age. *Journal of Reproductive and Infant Psychology* 2001; 19(2):135–145.

(71) Mensah FK, Kiernan KE. 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* 2011; 37(1):44–54.

(72) Bronfenbrenner U. The ecology of human development: experiments by nature and design. 1979. Cambridge, MA, Harvard University Press.

(73) Bronfenbrenner U, Ceci SJ. Nature-nurture reconceptualized in developmental perspective: a bioecological model. *Psychological Review* 1994; 101(4):568–586.

(74) Collins WA, Maccoby EE, Hetherington EM, Bornstein MH. Contemporary research on parenting: the case for nature and nurture. *American Psychologist* 2000; 55(2):218–232.

(75) Bronfenbrenner U, Evans GW. Developmental science in the 21st century: emerging questions, theoretical models, research designs and empirical findings. *Social Development* 2000; 9(1):115–125.

(76) Tudge JR, Mokrova I, Hatfield BE, Karnik RB. Uses and misuses of Bronfenbrenner's bioecological theory of human development. *Journal of Family Theory and Review* 2009; 1(4):198–210.

(77) Drew E, Humbert AL. 'Men have careers, women have babies': unequal parental care among Irish entrepreneurs. *Community, Work and Family* 2012; 15(1):46–67.

(78) Belsky J. The determinants of parenting: a process model. *Child Development* 1984; 55(1):83–96.

(79) Sameroff AJ. Early influences on development: fact or fancy? *Journal of Developmental Psychology* 1975; 21(4):267–294.

(80) Elder JGH. Children of the Great Depression: social change in life experience. 1974. Chicago, USA, University of Chicago Press.

(81) Kuh D, Ben-Shlomo Y, Lynch J, Hallqvist J, Power C. Life course epidemiology. *Journal of Epidemiology and Community Health* 2003; 57(10):778–783.

(82) Feske U, Shear MK, Anderson B, Cyranowski J, Strassburger M, Matty M et al. Comparison of severe life stress in depressed mothers and non-mothers: do children matter? *Depression and Anxiety* 2001; 13(3):109–117.

(83) Nicholson JS, Deboeck PR, Farris JR, Boker SM, Borkowski JG. Maternal depressive symptomatology and child behavior: transactional relationship with simultaneous bidirectional coupling. *Developmental Psychology* 2011; 47(5):1312–1323.

(84) Forbes EE, Shaw DS, Silk JS, Feng X, Cohn FC, Fox NA et al. Children's affect expression and frontal EEG asymmetry: transactional associations with mothers' depressive symptoms. *Journal of Abnormal Child Psychology* 2008; 36:207–221.

(85) Gross HE, Shaw DS, Moilanen KL. Reciprocal associations between boys' externalizing problems and mothers' depressive symptoms. *Journal of Abnormal Child Psychology* 2008; 36:693–709.

(86) Scott S. Do parenting programmes for severe child antisocial behaviour work over the longer term, and for whom? One year follow-up of a multi-centre controlled trial. *Behavioural and Cognitive Psychotherapy* 2005; 33(4):403–421.

(87) Leve L, Kim H, Pears K. Childhood temperament and family environment as predictors of internalizing and externalizing trajectories from ages 5 to 17. *Journal of Abnormal Child Psychology* 2005; 33(5):505–520.

(88) Drabick DAG, Beauchaine TP, Gadow KD, Carlson GA, Bromet EJ. Risk factors for conduct problems and depressive symptoms in a cohort of Ukrainian children. *Journal of Clinical Child and Adolescent Psychology* 2006; 35(2):244–252.

(89) Rothbart MK, Hwang J. Measuring infant temperament. *Infant Behavior and Development* 2002; 25:113–116.

(90) Rothbart MK, Bates JE. Temperament. In: Damon W., Lerner RM, Eisenberg N., eds. Handbook of child psychology: vol. 3, social, emotional, and personality development. 6th ed. 2006. New York, Hoboken, John Wiley & Sons Inc; 99–166.

(91) Caspi A, Henry B, McGee RO, Moffitt TE, Silva PA. Temperamental origins of child and adolescent behavior problems: from age three to age fifteen. *Child Development* 1995; 66(1):55–68.

(92) Van Goozen SHM, Fairchild G, Snoek H, Harold GT. The evidence for a neurobiological model of childhood antisocial behaviour. *Psychological Bulletin* 2007; 133(1):149–182.

(93) Blatt-Eisengart I, Drabick DAG, Monahan KC, Steinberg L. Sex differences in the longitudinal relations among family risk factors and childhood externalising symptoms. *Developmental Psychology* 2009; 45(2):491–502.

(94) Patterson GR. A social learning approach, volume 3: coercive family process. 1982. Eugene, OR, Castalia.

(95) Elder GH, Jr., Shanahan MJ. The lifecourse and human development. In: Damon W, Lerner RM, editors. Handbook of child psychology, volume 1: theoretical models of human development. 6th ed. 2006. New Jersey, John Wiley & Sons; 665–715.

(96) Giele JZ, Elder JGH. Methods of lifecourse research: qualitative and quantitative approaches. 1998. California, USA, Sage Publications.

(97) Blane D, Netuveli G, Stone J. The development of life course epidemiology. *Revue d'Épidémiologie et de Santé Publique* 2007; 55(1):31–38.

(98) Barker DJP, Forsen T, Uutela A, Osmond C, Eriksson JG. Size at birth and resilience to effects of poor living conditions in adult life: longitudinal study. *British Medical Journal* 2001; 323(7324):1273.

(99) Lawlor DA, Leary S, Davey Smith G. Theoretical underpinning for the use of intergenerational studies in life course epidemiology. In: Lawlor DA, Mishra GD, eds. Family matters: designing, analysing and understanding family-based studies in life course epidemiology. 2009. Oxford, Oxford University Press; 13–38.

(100) Hallqvist J, Lynch J, Bartley M, Lang T, Blane D. Can we disentangle life course processes of accumulation, critical period and social mobility? An analysis of disadvantaged socio-economic positions and myocardial infarction in the Stockholm Heart Epidemiology Program. *Social Science and Medicine* 2004; 58(8):1555–1562.

(101) Davey Smith G, Hart C, Blane D, Gillis C, Hawthorne V. Lifetime socioeconomic position and mortality: prospective observational study. *British Medical Journal* 1997; 314(7080):547.

(102) Kuh D, Ben-Shlomo Y. Introduction. In: Kuh D, Ben-Shlomo Y, eds. A life course approach to chronic disease epidemiology. 2nd ed. 2004. Oxford, Oxford University Press; 3–14.

(103) Brennan PA, Hammen C, Anderson MJ, Bor W, Najman JM, Williams GM. Chronicity, severity, and timing of maternal depressive symptoms: relationships with child outcomes at age 5. *Developmental Psychology* 2000; 36(6):759–766.

(104) Bagner DM, Pettit JW, Lewinsohn PM, Seeley JR. Effect of maternal depression on child behavior: a sensitive period? *Journal of the American Academy of Child and Adolescent Psychiatry* 2010; 49(7):699–707.

(105) Kim-Cohen J, Moffitt TE, Taylor A, Pawlby SJ, Caspi A. Maternal depression and children's antisocial behaviour: nature and nurture effects. *Archives of General Psychiatry* 2005; 62(2):173–181.

(106) Essex MJ, Klein MH, Smider NA. Timing of initial exposure to maternal major depression and children's mental health symptoms in kindergarten. *The British Journal of Psychiatry* 2001; 179(2):151–156.

(107) Essex MJ, Klein MH, Cho E, Kalin NH. Maternal stress beginning in infancy may sensitize children to later stress exposure: effects on cortisol and behavior. *Biological Psychiatry* 2002; 52(8):776–784.

(108) Essex MJ, Klein MH, Cho E, Kraemer HC. Exposure to maternal depression and marital conflict: gender differences in children's later mental health symptoms. *Journal of the American Academy of Child and Adolescent Psychiatry* 2003; 42(6):728–737.

(109) Krieger N. Epidemiology and the web of causation: has anyone seen the spider? *Social Science and Medicine* 1994; 39(7):887–903.

(110) Conger RD, Conger KJ, Elder GH, Jr, Lorenz FO, Simons RL, Whitbeck LB. Family economic stress and adjustment of early adolescent girls. *Development Psychology* 1993; 29(2):206–219.

(111) McLeod JD, Shanahan MJ. Poverty, parenting, and children's mental health. *American Sociological Review* 1993; 58(3):351–366.

(112) McLoyd VC. The Impact of economic hardship on black families and children: psychological distress, parenting, and socioemotional development. *Child Development* 1990; 61(2):311–346.

(113) Conger RD, Elder GH, Jr. Families in troubled times: adapting to change in rural America. 1994. New York, Aldine de Gruyter.

(114) Conger RD, Conger KJ. Resilience in Midwestern families: selected findings from the first decade of a prospective, longitudinal study. *Journal of Marriage and the Family* 2002; 64(2):361–373.

(115) Elder GH, Jr., Nguyen TV, Caspi A. Linking family hardship to children's lives. *Child Development* 1985; 56(2):361–375.

(116) Conger RD, Conger KJ, Martin MJ. Socioeconomic status, family processes, and individual development. *Journal of Marriage and Family* 2010; 72:685–704.

(117) Schoon I, Sacker A, Bartley M. Socio-economic adversity and psychosocial adjustment: a developmental-contextual perspective. *Social Science and Medicine* 2003; 57(6):1001–1015.

(118) Barnett MA. Economic disadvantage in complex family systems: expansion of family stress models. *Clinical Child and Family Psychology Review* 2008; 11:145–161.

(119) Conger RD, McLoyd VC, Wallace LE, Sun Y, Simons RL, Brody GH. Economic pressure in African American families: a replication and extension of the family stress model. *Developmental Psychology* 2002; 38(2):179–193.

(120) Parke RD, Coltrane S, Duffy S, Buriel R, Dennis J, Powers J et al. Economic stress, parenting, and child adjustment in Mexican American and European American families. *Child Development* 2004; 75(6):1632–1656.

(121) Solantaus T, Leinonen J, Punamäki RL. Children's mental health in times of economic recession: replication and extension of the Family Economic Stress Model in Finland. *Developmental Psychology* 2004; 40(3):412–429.

(122) Bruce ML, Takeuchi DT, Leaf PJ. Poverty and psychiatric status: longitudinal evidence from the New Haven Epidemiologic Catchment Area Study. *Archives of General Psychiatry* 1991; 48(5):470–474.

(123) Brown GW, Harris T. Social origins of depression: a study of psychiatric disorder in women. 1978. New York, The Free Press.

(124) Sareen J, Afifi TO, McMillan KA, Asmundson G. Relationship between household income and mental disorders: findings from a population-based longitudinal study. *Archives of General Psychiatry* 2011; 68(4):419–427.

(125) Lorant V, Deliège D, Eaton W, Robert A, Philippot P, Ansseau M. Socioeconomic inequalities in depression: a meta-analysis. *American Journal of Epidemiology* 2003; 157(2):98–112.

(126) McKee-Ryan F, Song Z, Wanberg CR, Kinicki AJ. Psychological and physical well-being during unemployment: a meta-analytic study. *Journal of Applied Psychology* 2005; 90(1):53–76.

(127) Orbuch TL, Veroff J, Hassan H, Horrocks J. Who will divorce: a 14-year longitudinal study of black couples and white couples. *Journal of Social and Personal Relationships* 2002; 19(2):179–202.

(128) Isen A, Stevenson B. Women's education and family behavior: trends in marriage, divorce, and fertility. In: Shoven JB, ed. Demography and the economy. 2011. Chicago, USA, The University of Chicago Press; 107–142.

(129) Rendall MS, Couet C, Lappegard T, Robert-Bobée I, Rønsen M, Smallwood S. First births by age and education in Britain, France and Norway. *Population Trends* 2005; 121:27–34.

(130) Mistry RS, Biesanz JC, Taylor LC, Burchinal M, Cox MJ. Family income and its relation to preschool children's adjustment for families in the NICHD Study of early child care. *Developmental Psychology* 2004; 40(5):727–745.

(131) Brooks-Gunn J, Klebanov PK, Liaw FR. The learning, physical, and emotional environment of the home in the context of poverty: the infant health and development program. *Children and Youth Services Review* 1995; 17(1-2):251–276.

(132) Brooks-Gunn J, Duncan GJ. The effects of poverty on children. *Children and Poverty* 1997; 7(2):55–71.

(133) Brown GW, Moran PM. Single mothers, poverty and depression. *Psychological Medicine* 1997; 27(01):21–33.

(134) Wilkinson RG, Marmot MG. Social determinants of health: the solid facts. 2nd ed. 2003. Denmark, World Health Organization: Regional Office for Europe.

(135) Brooks-Gunn J, Markman LB. The contribution of parenting to ethnic and racial gaps in school readiness. *The Future of Children* 2005; 15(1):139–168.

(136) Ermisch J. Origins of social immobility and inequality: parenting and early child development. *National Institute Economic Review* 2008; 205:62–71.

(137) Feinstein L. Inequality in the early cognitive development of British children in the 1970 Cohort. *Economica* 2003; 70(277):73–97.

(138) Kelly Y, Sacker A, Del Bono E, Francesconi M, Marmot M. What role for the home learning environment and parenting in reducing the socioeconomic gradient in child development? Findings from the Millennium Cohort Study. *Archives of Diseases in Childhood* 2011; 96(9):832–837.

(139) Irwin LG, Siddiqi A, Hertzman C. Early child development: a powerful equalizer. 2007. Geneva, WHO.

(140) Office for National Statistics. General Lifestyle Survey overview: a report on the 2009 General Lifestyle Survey. Dunstan S, ed. 2011. UK, Office for National Statistics.

(141) Zeider KH, Roosa MW, Tein J-Y. Family structure and family processes in Mexican-American families. *Family Process* 2011; 50(1):77–91.

(142) Hope S, Power C, Rodgers B. Does financial hardship account for elevated psychological distress in lone mothers? *Social Science and Medicine* 1999; 49:1637–1649.

(143) Kiernan KE, Huerta CH. Economic deprivation, maternal depression, parenting and children's cognitive and emotional development in early childhood. *The British Journal of Sociology* 2008; 59(4):783–806.

(144) McMunn AM, Nazroo JY, Marmot MG, Boreham R, Goodman R. Children's emotional and behavioural well-being and the family environment: findings from the Health Survey for England. *Social Science and Medicine* 2001; 53(4):423–440.

(145) Wiggins M, Oakley A, Sawtell M, Austerberry H, Clemens F, Elbourne D. Teenage parenthood and social exclusion: a multi-method study: summary report of findings. London: Social Science Research Unit Report, Institute of Education, 1- 95.

(146) Simpson JA, Rholes WS, Campbell L, Tran S, Wilson CL. Adult attachment, the transition to parenthood, and depressive symptoms. *Journal of Personality and Social Psychology* 2003; 84(6):1172–1187.

(147) Reading R, Reynolds S. Debt, social disadvantage and maternal depression. *Social Science and Medicine* 2001; 53:441–453.

(148) Crockenberg SC, Leerkes EM. Parental acceptance, postpartum depression, and maternal sensitivity: mediating and moderating processes. *Journal of Family Psychology* 2003; 17(1):80–93.

(149) Kinnunen U, Feldt T. Economic stress and marital adjustment among couples: analyses at the dyadic level. *European Journal of Social Psychology* 2004; 34(5):519–532.

(150) Aytaç IA, Rankin BH. Economic crisis and marital problems in Turkey: testing the Family Stress Model. *Journal of Marriage and Family* 2009; 71(3):756–767.

(151) Kwon HK, Rueter MA, Lee MS, Koh S, Ok SW. Marital relationships following the Korean economic crisis: applying the Family Stress Model. *Journal of Marriage and Family* 2003; 65(2):316–325.

(152) Overbeek G, Vollebergh W, de Graaf R, Scholte R, de Kemp R, Engels R. Longitudinal associations of marital quality and marital dissolution with the incidence of DSM-III-R disorders. *Journal of Family Psychology* 2006; 20(2):284–291.

(153) Conger RD, Rueter MA, Elder GH, Jr. Couple resilience to economic pressure. *Journal of Personality and Social Psychology* 1999; 76(1):54–71.

(154) Wu Z, Pollard MS. Economic circumstances and the stability of nonmarital cohabitation. *Journal of Family Issues* 2000; 21(3):303–328.

(155) Baumrind D. The average expectable environment is not good enough: a response to Scarr. *Child Development* 1993; 64(5):1299–1317.

(156) Baumrind D. Effects of authoritative parental control on child behavior. *Child Development* 1966; 37(4):887–907.

(157) Chang L, Lansford J, Schwartz D, Farver JM. Marital quality, maternal depressed affect, harsh parenting and child externalising in Hong Kong Chinese families. *International Journal of Behavioural Development* 2004; 28(4):311–318.

(158) Belsky J, Hsieh KH, Crnic K. Mothering, fathering, and infant negativity as antecedents of boys' externalizing problems and inhibition at age 3 years: differential susceptibility to rearing experience? *Development and Psychopathology* 1998; 10(02):301–319.

(159) Rothbaum F, Weisz JR. Parental caregiving and child externalizing behavior in nonclinical samples: a meta-analysis. *Psychological Bulletin* 1994; 116(1):55–74.

(160) Deater-Deckard K, Ivy L, Petrill SA. Maternal warmth moderates the link between physical punishment and child externalizing problems: a parent-offspring behavior genetic analysis. *Parenting: Science and Practice* 2006; 6(1):59–78.

(161) McLeod BD, Wood JJ, Weisz JR. Examining the association between parenting and childhood anxiety: a meta-analysis. *Clinical Psychology Review* 2007; 27(2):155–172.

(162) Johnson JG, Cohen P, Kasen S, Smailes E, Brook JS. Association of maladaptive parental behavior with psychiatric disorder among parents and their offspring. *Archives of General Psychiatry* 2001; 58(5):453–460.

(163) Fagot BI, Hagan R, Leinbach MD, Kronsberg S. Differential reactions to assertive and communicative acts of toddler boys and girls. *Child Development* 1985; 56(6):1499–1505.

(164) Leadbeater BJ, Kuperminc GP, Blatt SJ, Hertzog C. A multivariate model of gender differences in adolescents' internalizing and externalizing problems. *Developmental Psychology* 1999; 35(5):1268–1282.

(165) Scaramella LV, Conger RD, Simons RL. Parental protective influences and gender-specific increases in internalising and externalising problems. *Journal of Research on Adolescence* 1999; 9(2):111–141.

(166) Webster-Stratton C. Early onset conduct problems: does gender make a difference? *Journal of Consulting and Clinical Psychology* 1996; 64(3):540–551.

(167) Kerr D, Lopez N, Olson S, Sameroff A. Parental discipline and externalizing behavior problems in early childhood: the roles of moral regulation and child gender. *Journal of Abnormal Child Psychology* 2004; 32(4):369–383.

(168) Shaw DS, Keenan K, Vondra JI. Developmental precursors of externalizing behavior: ages 1 to 3. *Developmental Psychology* 1994; 30(3):355–364.

(169) Fadyen-Ketchum SA, Bates JE, Dodge KA, Pettit GS. Patterns of change in early childhood aggressive-disruptive behavior: gender differences in predictions from early coercive and affectionate mother-child interactions. *Child Development* 2009; 67(5):2417–2433.

(170) Gordis EB, Margolin G, John RS. Parents' hostility in dyadic marital and triadic family settings and children's behavior problems. *Journal of Consulting and Clinical Psychology* 2001; 69(4):727–734.

(171) Compton K, Snyder J, Schrepferman L, Bank L, Shortt JW. The contribution of parents and siblings to antisocial and depressive behavior in adolescents: a double jeopardy coercion model. *Development and Psychopathology* 2003; 15(01):163–182.

(172) Malmberg LE, Flouri E. The comparison and interdependence of maternal and paternal influences on young children's behavior and resilience. *Journal of Clinical Child and Adolescent Psychology* 2011; 40(3):434–444.

(173) Gryczkowski M, Jordan S, Mercer S. Differential relations between mothers' and fathers' parenting practices and child externalizing behavior. *Journal of Child and Family Studies* 2010; 19(5):539–546.

(174) Trautmann-Villalba P, Gschwendt M, Schmidt MH, Laucht M. Father-infant interaction patterns as precursors of children's later externalising behavior problems: a longitudinal study over 11 years. *European Archives of Psychiatry and Clinical Neuroscience* 2006; 256:344–349.

(175) Deater-Deckard K, Dodge KA. Externalizing behavior problems and discipline revisited: nonlinear effects and variation by culture, context, and gender. *Psychological Inquiry* 1997; 8(3):161–175.

(176) DeKlyen M, Biernbaum MA, Speltz ML, Greenberg MT. Fathers and preschool behavior problems. *Developmental Psychology* 1998; 34(2):264–275.

(177) Lancet Global Mental Health Group. Scale up services for mental disorders: a call for action. *The Lancet* 2007; 370(9594):1241–1252.

(178) Fergusson DM, Lynskey MT. The effects of maternal depression on child conduct disorder and attention deficit behaviours. *Social Psychiatry and Psychiatric Epidemiology* 1993; 28(3):116–123.

(179) Goodman A, Goodman R. Strengths and difficulties questionnaire as a dimensional measure of child mental health. *Journal of the American Academy of Child and Adolescent Psychiatry* 2009; 48(4):400–403.

(180) Connell AM, Goodman SH. The association between psychopathology in fathers versus mothers and children's internalizing and externalizing behavior problems: a meta-analysis. *Psychological Bulletin* 2002; 128(5):746–773.

(181) Callender K, Olson S, Choe D, Sameroff A. The effects of parental depressive symptoms, appraisals, and physical punishment on later child externalizing behavior. *Journal of Abnormal Child Psychology* 2011;1–13.

(182) Nomura Y, Wickramaratne P, Warner V, Mufson L, Weissman MM. Family discord, parental depression, and psychopathology in offspring: ten-year follow-up. *Journal of the American Academy of Child and Adolescent Psychiatry* 2002; 41(4):402–409.

(183) Wickramaratne P, Gameroff MJ, Pilowsky DJ, Hughes CW, Garber J, Malloy E et al. Children of depressed mothers one year after remission of maternal depression: findings from the STAR*D-Child Study. *American Journal of Psychiatry* 2011; 168(6):593–602.

(184) Hipwell A, Keenan K, Kasza K, Loeber R, Stouthamer-Loeber M, Bean T. Reciprocal influences between girls' conduct problems and depression, and parental punishment and warmth: a six year prospective analysis. *Journal of Abnormal Child Psychology* 2008; 36(5):663–677.

(185) Conger RD, Ge X, Elder GH, Jr, Lorenz FO, Simons RL. Economic stress, coercive family process, and developmental problems of adolescents. *Child Development* 1994; 65(2):541–561.

(186) Conger RD, Elder GH, Jr. Families in troubled times: adapting to change in rural America. Social institutions and social change. 1994. New York, Aldine de Gruyter.

(187) Malmberg L-E, Flouri E. The comparison and interdependence of maternal and paternal influences on young children's behavior and resilience. *Journal of Clinical Child and Adolescent Psychology* 2011; 40(3):434–444.

(188) Chang JJ, Halpern CT, Kaufman JS. Maternal depressive symptoms, father's involvement, and the trajectories of child problem behaviors in a US national sample. *Archives of Pediatrics and Adolescent Medicine* 2007; 161(7):697–703.

(189) Mezulis AH, Hyde JS, Clark R. Father involvement moderates the effect of maternal depression during a child's infancy on child behavior problems in kindergarten. *Journal of Family Psychology* 2004; 18(4):575–588.

(190) DeKlyen M, Speltz ML, Greenberg MT. Fathering and early onset conduct problems: positive and negative parenting, father-son attachment, and the marital context. *Clinical Child and Family Psychology Review* 1998; 1(1):3–21.

(191) Hess LE. Changing family patterns in western Europe: opportunity and risk factors for adolescent development. In: Rutter M, Smith DJ, eds. Psychosocial disorders in young people: time trends and their causes. 1995. Chichester, Wiley; 105–117.

(192) Hughes M. Social trends. No.40. 2010. Office for National Statistics. UK.

(193) Scanzoni J. Families in the 1980s: time to refocus our thinking. *Journal of Family Issues* 1987; 8(4):394–421.

(194) Johnson J, Joshi H, Calderwood L, Jones E, McDonald J, Shepherd P et al. Millennium Cohort Study first, second, third and fourth surveys: a guide to the datasets. Hansen K, ed. 5th ed. 2010. London, Centre for Longitudinal Studies, University of London.

(195) Plewis I. Millennium Cohort Study: technical report on sampling. 4th ed. 2007. London, Centre for Longitudinal Studies, University of London.

(196) Office for National Statistics. Number of counties/districts/unitary authorities/wards etc. in the UK. 2004. ONS. UK. Available at: http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/administrative/england/electoral-wards-divisions/number-of-counties-districts-unitary-authorities-wards-etc-in-the-uk/index.html. Accessed 8 September 2011.

(197) Centre for Longitudinal Studies. Millennium Cohort Study: first survey, CAPI questionnaire documentation. 2003. Colchester, Essex, UK Data Archive.

(198) Centre for Longitudinal Studies. Millennium Cohort Study: first survey, 2001–2003. 8th ed. 2009. London, Institute of Education, University of London.

(199) Burt SA, Klahr AM, Rueter MA, McGue M, Iacono WG. Confirming the etiology of adolescent acting out behaviors: an examination of observer-ratings in a sample of adoptive and biological siblings. *Journal of Child Psychology and Psychiatry* 2011; 52(5):519–526.

(200) Rutter M, Redshaw J. Growing up as a twin: twin-singleton differences in psychological development. *Journal of Child Psychology and Psychiatry* 1991; 32(6):885–895.

(201) Rothman KJ, Greenland S, Lash TL. Modern epidemiology. 3rd ed. 2008. Philadelphia, USA, Lippincott Williams & Wilkins.

(202) Ecob R, Davey Smith G. Income and health: what is the nature of the relationship? *Social Science and Medicine* 1999; 48(5):693–705.

(203) Last JM. A dictionary of epidemiology. 4th ed. 2001. New York, Oxford University Press.

(204) Goodman R. The Strengths and Difficulties Questionnaire: a research note. *Journal of Child Psychology and Psychiatry* 1997; 38(5):581–586.

(205) Ford T, Vostanis P, Meltzer H, Goodman R. Psychiatric disorder among British children looked after by local authorities: comparison with children living in private households. *The British Journal of Psychiatry* 2007; 190(4):319–325.

(206) Goodman R, Ford T, Simmons H, Gatward R, Meltzer H. Using the Strengths and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. *The British Journal of Psychiatry* 2000; 177(6):534–539.

(207) Goodman R. Psychometric properties of the Strengths and Difficulties Questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry* 2001; 40(11):1337–1345.

(208) Achenbach T. Manual for the child behavior checklist/4–18 and 1991 profile. 1991. Burlington, VT, Department of Psychiatry, University of Vermont.

(209) Goodman R. Using the SDQ dimensions. Personal communication. 7 December 2010.

(210) Cook F, Bayer J, Le HN, Mensah F, Cann W, Hiscock H. Baby business: a randomised controlled trial of a universal parenting program that aims to prevent early infant sleep and cry problems and associated parental depression. *BMC Pediatrics* 2012; 12(13):doi:10.1186/1471-2431-12-13.

(211) Barr RG, Rivara FP, Barr M, Cummings P, Taylor J, Lengua LJ et al. Effectiveness of educational materials designed to change knowledge and behaviors regarding crying and shaken-baby syndrome in mothers of newborns: a randomized controlled trial. *Pediatrics* 2009; 123:972–980.

(212) Doran T, Fullwood C, Kortopantelis E, Reeves D. Effect of financial incentives on inequalities in the delivery of primary clinical care in England: analysis of clinical activity indicators for the quality and outcomes framework. *The Lancet* 2008; 372:728–736.

(213) Chunag CH, Jeng SF, Hsieh WS, Liao HF, Su YN, Chen PC. Maternal psychosocial factors around delivery, and the behavior of 2-year-old children. *Pediatrics International* 2011; 53(5):656–661.

(214) Goodman A, Patel V, Leon DA. Why do British Indian children have an apparent mental health advantage? *Journal of Child Psychology and Psychiatry* 2010; 51(10):1171–1183.

(215) Lumley T, Diehr P, Emerson S, Chen Lu. The importance of the normality assumption in large public health data sets. *Annual Review of Public Health* 2002; 23:151–169.

(216) Pagano RR. Understanding statistics in the behavioral sciences. 9th ed. 2010. Belmont, USA, Wadsworth.

(217) Tiffin PA, Arnott B, Moore HJ, Summerbell CD. Modelling the relationship between obesity and mental health in children and adolescents: findings from the health survey for England 2007. *Child and Adolescent Psychiatry and Mental Health* 2011; 5(31):doi:10.1186/1753-2000-5-31.

(218) Kelly Y, Bartley M, Schoon I, Hope S. Parents' health. In: Dex S, Joshi H, eds. Millennium Cohort Study first survey: a user's guide to initial findings. 2004. London, Centre for Longitudinal Studies, University of London; 140–158.

(219) Rutter M, Tizard J, Whitmore K. Education, health and behaviour. 1970. London, Longman.

(220) Kessler RC, Andrews G, Colpe LJ, Hiripr E, Mroczek DK, Normand SLT et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine* 2002; 32(06):959–976.

(221) Centre for Longitudinal Studies. Teaching students quantitative methods using resources from the British Birth Cohorts: Measuring signs of psychological distress and depression. The Malaise Inventory. 2010. London, Institute of Education.

(222) McGee R, Williams SM, Silva PA. An evaluation of the Malaise Inventory. *Journal of Psychosomatic Research* 1986; 30(2):147–152.

(223) Gale CR, Hatch SL, Batty GD, Deary IJ. Intelligence in childhood and risk of psychological distress in adulthood: the 1958 National Child Development Survey and the 1970 British Cohort Study. *Intelligence* 2011; 37(6):592–599.

(224) Grant G, Nolan M, Ellis N. A reappraisal of the Malaise Inventory. *Social Psychiatry and Psychiatric Epidemiology* 1990; 25(4):170–178.

(225) Power C, Manor O. Explaining social class differences in psychological health among young adults: a longitudinal perspective. *Social Psychiatry and Psychiatric Epidemiology* 1992; 27(6):284–291.

(226) Rodgers B, Pickles A, Power C, Collishaw S, Maughan B. Validity of the Malaise Inventory in general population samples. *Social Psychiatry and Psychiatric Epidemiology* 1999; 34(6):333–341.

(227) Flouri E, Tzavidis N, Kallis C. Adverse life events, area socioeconomic disadvantage, and psychopathology and resilience in young children: the importance of risk factors' accumulation and protective factors' specificity. *European Child and Adolescent Psychiatry* 2010; 19:535–546.

(228) Hawkes D, Joshi H. Unequal entry to motherhood and unequal outcomes for children: evidence from the UK Millennium Cohort. 2011. London, UK, Centre for Longitudinal Studies, University of London.

(229) Jayaweera H, Quigley MA. Health status, health behaviour and healthcare use among migrants in the UK: evidence from mothers in the Millennium Cohort Study. *Social Science and Medicine* 2010; 71:1002–1010.

(230) Flouri E, Malmberg LE. Child temperament and paternal transition to non-residence. *Infant Behavior and Development* 2010; 33(4):689–694.

(231) Kelly Y, Sacker A, Schoon I, Nazroo J. Ethnic differences in achievement of developmental milestones by 9 months of age: the Millennium Cohort Study. *Developmental Medicine and Child Neurology* 2006; 48(10):825–830.

(232) Sacker A, Quigley MA, Kelly YJ. Breastfeeding and developmental delay: findings from the Millennium Cohort Study. *Pediatrics* 2006; 118(3):e682-e689.

(233) Calderwood L, Kelly Y. Parental health and lifestyle. In: Hansen K, Joshi H, eds. MCS second survey: user's guide to initial findings. 2007. London, Centre for Longitudinal Studies, University of London; 110–146.

(234) Roberts T, Ketende SC. Parental health. In: Hansen K, Joshi H, eds. MCS third survey: a guide to initial findings. 2008. London, Centre for Longitudinal Studies, University of London; 170–202.

(235) Maughan B. Changing the MCS measure of mother's psychological distress. Personal communication. 6 December 2010.

(236) Angold A, Messer SC, Stangl D, Farmer EM, Costello EJ, Burns BJ. Perceived parental burden and service use for child and adolescent psychiatric disorders. *American Journal of Public Health* 1998; 88(1):75–80.

(237) Furukawa TA, Kessler RC, Slade T, Andrews G. The performance of the K6 and K10 screening scales for psychological distress in the Australian National Survey of Mental Health and Well-Being. *Psychological Medicine* 2003; 33(02):357–362.

(238) Veldhuizen S, Cairney J, Kurdyak P, Streiner DL. The sensitivity of the K6 as a screen for any disorder in community mental health surveys: a cautionary note. *The Canadian Journal of Psychiatry* 2009; 52(4):256–259.

(239) Hilton MF, Sheridan J, Cleary CM, Whiteford HA. Employee absenteeism measures reflecting current work practices may be instrumental in a re-evaluation of the relationship between psychological distress/mental health and absenteeism. *International Journal of Methods in Psychiatric Research* 2009; 18(1):37–47.

(240) Hobcraft JN, Kiernan KE. Predictive factors from age 3 and infancy for poor child outcomes at age 5 relating to children's development, behaviour and health: evidence from the Millennium Cohort Study. 2010. York, UK, University of York.

(241) Mensah F, Kiernan K. Parents' mental health and children's cognitive and social development: families in England in the Millennium Cohort Study. *Social Psychiatry and Psychiatric Epidemiology* 2010; 45(11):1023–1035.

(242) Oraka E, King ME, Callahan DB. Asthma and serious psychological distress. *Chest* 2010; 137(3):609–616.

(243) Shih M, Simon PA. Health-related quality of life among adults with serious psychological distress and chronic medical conditions. *Quality of Life Research* 2008; 17:521–528.

(244) Bradshaw M, Ellison CG. Financial hardship and psychological distress: exploring the buffering effects of religion. *Social Science and Medicine* 2010; 71(1):196–204.

(245) Gadalla TM. Determinants, correlates and mediators of psychological distress: a longitudinal study. *Social Science and Medicine* 2009; 68(12):2199–2205.

(246) Fraser AM, Brockert JE, Ward RH. Association of young maternal age and adverse reproductive outcomes. *New England Journal of Medicine* 1995; 332:1113–1118.

(247) Bradshaw J, Millar J. Lone parent families in the UK. Department of Social Security Report No. 6. 1991. London, HMSO.

(248) Delbeare I, Verstraelen H, Goetgeluk S, Martens G, De Backer G, Temmerman M. Pregnancy outcomes in primiparae of advanced maternal age. *European Journal of Obstetrics and Gynecology and Reproductive Biology* 2007; 135(1):41–46.

(249) WHO. Health status statistics: morbidity. Low birthweight newborns (percentage). 2011. Available at: http://www.who.int/healthinfo/statistics/indlowbirthweight/en/index.html Accessed 27 May 2011.

(250) Hack M, Youngstrom EA, Cartar L, Schluchter M, Taylor HG, Flannery D et al. Behavioral outcomes and evidence of psychopathology among very low birth weight infants at age 20 years. *Pediatrics* 2004; 114(4):932–940.

(251) Shiono PH, Behrman RE. Low birth weight. *The Future of Children* 1995; 5(1):4–18.

(252) Propper C, Rigg J, Burgess S. Child health: evidence on the roles of family income and maternal mental health from a UK birth cohort. *Health Economics* 2007; 16(11):1245–1269.

(253) Burns J, Baghurst P, Swayer M, McMichael A, Tong SL. Lifetime low-level exposure to environmental lead and children's emotional and behavioural development at ages 11–13 years: The Port Pirie Cohort Study. *American Journal of Epidemiology* 1999; 149(8):740–749.

(254) Klebanov PK, Brooks-Gunn J, Duncan GJ. Does neighbourhood and family poverty affect mothers' parenting, mental health, and social support? *Journal of Marriage and the Family* 1994; 56:441–455.

(255) Smith JR, Brooks-Gunn J, Klebanov PK. Consequences of living in poverty for young children's cognitive and verbal ability and school achievement: an ecological perspective. In: Duncan GJ, Brooks-Gunn J, eds. Consequences of growing up poor. 1997. New York, Russell Sage Foundation; 132–189.

(256) Nazroo JY. Genetic, cultural or socio-economic vulnerability? Explaining ethnic inequalities in health. *Sociology of Health and Illness* 1998; 20(5):710–730.

(257) McClements LD. Equivalence scales for children. *Journal of Public Economics* 1977; 8(2):191–210.

(258) Banks J, Marmot M, Oldfield Z, Smith J. Disease and disadvantage in the United States and in England. *The Journal of the American Medical Association* 2006; 295(17):2037–2045.

(259) McMunn A, Kelly Y, Cable N, Bartley M. Maternal employment and child socio-emotional behaviour in the UK: longitudinal evidence from the UK Millennium Cohort Study. *Journal of Epidemiology and Community Health* 2011; doi:10.1136/jech.2010.109553.

(260) Dex S, Ward K, Joshi H. Income and benefits. In: Dex S, Joshi H, eds. Millennium Cohort Study first survey: a user's guide to initial findings. 2004. London, Centre for Longitudinal Studies, University of London; 227–244.

(261) Directgov. Qualifications: what the different levels mean. 2010. Available at: http://www.direct.gov.uk/en/EducationAndLearning/QualificationsExplained / DG_10039017. Accessed 19 July 2010.

(262) Trentacosta CJ, Hyde LW, Shaw DS, Dishion TJ, Gardner F, Wilson M. The relations among cumulative risk, parenting, and behavior problems during early childhood. *Journal of Child Psychology and Psychiatry* 2008; 49(11):1211–1219.

(263) Dale A, Williams M, Dodgeon B. Housing deprivation and social change: a report based on the analysis of individual level census data for 1971, 1981 and 1991 drawn from the Longitudinal Study and the Samples of Anonymised Records. Series LS No. 8. 1996. London, HMSO.

(264) Pianta RC. Adult-child relationship processes and early schooling. *Early Education and Development* 1997; 8(1):11–26.

(265) Caldwell BM, Bradley RH. Home observation for measurement of the environment. 1984. Little Rock, AR, University of Arkansas.

(266) Jackson AP, Brooks-Gunn J, Huang CC, Glassman M. Single mothers in low-wage jobs: financial strain, parenting, and preschoolers' outcomes. *Child Development* 2000; 71(5):1409–1423.

(267) Leventhal T, Martin A, Brooks-Gunn J. The EC-HOME across five national data sets in the 3rd to 5th year of life. *Parenting: Science and Practice* 2004; 4(2):161-188.

(268) Linver MR, Brooks-Gunn J, Cabrera N. The Home Observation for Measurement of the Environment (HOME) inventory: the derivation of conceptually designed subscales. *Parenting: Science and Practice* 2004; 4(2):99–114.

(269) Pianta RC, Steinberg MS, Rollins KB. The first two years of school: teacher-child relationships and deflections in children's classroom adjustment. *Development and Psychopathology* 1995; 7(02):295–312.

(270) Pianta RC. Child-parent relationship scale: unpublished measure. 1995. Charlottesville, VA, University of Virginia.

(271) Parsons S. British Cohort Study 2004 follow up: guide to child paper questionnaires. 1st ed. 2006. London, Institute of Education.

(272) Straus MA, Hamby SL, Finkelhor D, Moore DW, Runyan D. Identification of child maltreatment with the parent-child conflict tactics scales: development and psychometric data for a national sample of American parents. *Child Abuse and Neglect* 1998; 22(4):249–270.

(273) Carey WB. A simplified method for measuring infant temperament. *The Journal of Pediatrics* 1970; 77(2):188–194.

(274) Carey WB, McDevitt SC. Revision of the infant temperament questionnaire. *Pediatrics* 1978; 61(5):735–739.

(275) Dezateux C, Bedford H, Cole T, Peckham C, Schoon I, Hope S et al. Babies' health and development. In: Dex S, Joshi H, eds. Millennium Cohort Study first survey: a user's guide to initial findings. 2004. London, Centre for Longitudinal Studies, University of London; 101–130.

(276) Condon JT, Corkindale CJ. The assessment of parent-to-infant attachment: development of a self-report questionnaire instrument. *Journal of Reproductive and Infant Psychology* 1998; 16(1):57–76.

(277) Pickett KE, Wilkinson RG, Wakschlag LS. The psychosocial context of pregnancy smoking and quitting in the Millennium Cohort Study. *Journal of Epidemiology and Community Health* 2009; 63:474–480.

(278) Kleinbaum DG. Logistic regression: a self-learning text. 1994. New York, Springer-Verlag.

(279) Elder JGH. The life course as developmental theory. *Child Development* 1998; 69(1):1–12.

(280) Victora CG, Huttly SR, Fuchs SC, Olinto MT. The role of conceptual frameworks in epidemiological analysis: a hierarchical approach. *International Journal of Epidemiology* 1997; 26(1):224–227.

(281) Pearce N. A short introduction to epidemiology. Occasional Report Series No. 2. 2nd ed. 2005. Wellington, New Zealand, Centre for Public Health Research.

(282) Hanington L, Ramchandani P, Stein A. Parental depression and child temperament: assessing child to parent effects in a longitudinal population study. *Infant Behavior and Development* 2010; 33:88–95.

(283) Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology* 1986; 51(6):1173–1182.

(284) Taris T, Kompier M. Games researchers play: extreme-groups analysis and mediation analysis in longitudinal occupational health research. *Scandinavian Journal of Work, Environment and Health* 2006; 32(6):463–472.

(285) Chen X, Stanton B, Fang X, Li X, Lin D, Zhang J et al. Perceived smoking norms, socioenvironmental factors, personal attitudes and adolescent smoking in China: a mediation analysis with longitudinal data. *Journal of Adolescent Health* 2006; 38(4):359–368.

(286) Walker A, Maher J, Coulthard M, Goddard E, Thomas M. Living in Britain: results from the 2000/2001 General Household Survey. 2001. Norwich, HMSO.

(287) Hill AB. The environment and disease: association or causation? *Proceedings of the Royal Society of Medicine* 1965; 58(5):295–300.

(288) Meltzer H, Gatward R, Goodman R, Ford T. The mental health of children and adolescents in Great Britain: summary report. 2000. London, UK, Crown Copyright.

(289) Hope S, Rodgers B, Power C. Marital status transitions and psychological distress: longitudinal evidence from a national population sample. *Psychological Medicine* 1999; 29:381–389.

(290) Haurin DR, Parcel TL, Haurin JR. Does homeownership affect child outcomes? *Real Estate Economics* 2002; 30(4):635–666.

(291) Leinonen JA, Solantaus TS, Punamäki RL. Social support and the quality of parenting under economic pressure and workload in Finland: the role of family structure and parental gender. *Journal of Family Psychology* 2003; 17(3):409–418.

(292) Brown GW, Andrews B, Harris T, Adler Z, Bridge L. Social support, self-esteem and depression. *Psychological Medicine* 1986; 16(4):813–831.

(293) Brown GW, Bifulco A. Motherhood, employment and the development of depression. A replication of a finding? *The British Journal of Psychiatry* 1990; 156(2):169–179.

(294) Gualtieri T, Hicks R. An immunoreactive theory of selective male affliction. *Behavioral and Brain Sciences* 1985; 8:427–441.

(295) Kraemer S. Lessons from everywhere: the fragile male. *British Medical Journal* 2000; 321:1609–1612.

(296) Combs-Ronto L, Olson S, Lunkenheimer E, Sameroff A. Interactions between maternal parenting and children's early disruptive behavior: bidirectional associations across the transition from preschool to school entry. *Journal of Abnormal Child Psychology* 2009; 37(8):1151–1163.

(297) McLeod JD, Kruttschnitt C, Dornfeld M. Does parenting explain the effects of structural conditions on children's antisocial behavior? A comparison of Blacks and Whites. *Social Forces* 1994; 73(2):575–604.

(298) Pardini D, Fite P, Burke J. Bidirectional associations between parenting practices and conduct problems in boys from childhood to adolescence: the moderating effect of age and African-American ethnicity. *Journal of Abnormal Child Psychology* 2008; 36(5):647–662.

(299) Van Oers HJJ, de Kloet ER, Levine S. Early vs late maternal deprivation differentially alters the endocrine and hypothalamic responses to stress. *Developmental Brain Research* 1998; 111(2):245–252.

(300) Herztman C, Boyce T. How experience gets under the skin to create gradients in developmental health. *Annual Review of Public Health* 2010; 31:329–347.

(301) Kudielka BM, Kirschbaum C. Sex differences in HPA axis responses to stress: a review. *Biological Psychology* 2005; 69:113–132.

(302) Steptoe A, van Jaarsveld C, Semmler C, Plomin R, Wardle J. Heritability of daytime cortisol levels and cortisol reactivity in children. *Psychoneuroendocrinology* 2009; 34(2):273–280.

(303) Davis M, Emory E. Sex differences in neonatal stress reactivity. *Child Development* 1995; 66(1):14–27.

(304) Martin CL, Ruble DN, Szkrybalo J. Cognitive theories of early gender development. *Psychological Bulletin* 2002; 128(6):903–933.

(305) Perry DG, Bussey K. The social learning theory of sex differences: imitation is alive and well. *Journal of Personality and Social Psychology* 1979; 37(10):1699–1712.

(306) Scott S, Dadds MR. Practitioner review: when parent training doesn't work: theory-driven clinical strategies. *The Journal of Child Psychology and Psychiatry* 2009; 50(12):1441–1450.

(307) Fagot BI, Hagan R, Leinbach MD, Kronsberg S. Differential reactions to assertive and communicative acts of toddler boys and girls. *Child Development* 1985; 56(6):1499–1505.

(308) Brody GH, Flor DL, Gibson NM. Linking maternal efficacy beliefs, developmental goals, parenting practices, and child competence in rural single-parent African American families. *Child Development* 1997; 70(5):1197–1208.

(309) Kaufman JS. Social epidemiology. In: Rothman KJ, Greenland S, Lash TL, eds. Modern epidemiology. 3rd ed. 2008. Philadelphia, PA, Lippincott Williams & Wilkins; 532–548.

(310) Krieger N. Embodiment: a conceptual glossary for epidemiology. *Journal of Epidemiology and Community Health* 2005; 59(5):350–355.

(311) Hart S, Field T, Roitfarb M. Depressed mothers' assessment of their neonates behaviours. *Infant Mental Health Journal* 1999; 20(2):200–210.

(312) Richters JE. Depressed mothers as informants about their children: a critical review of the evidence for distortion. *Psychological Bulletin* 1992; 112(3):485–499.

(313) Müller JM, Achtergarde S, Furniss T. The influence of maternal psychopathology on ratings of child psychiatric symptoms: an SEM analysis on cross-informant agreement. *European Child and Adolescent Psychiatry* 2011; 20(5):241–252.

(314) Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *The Journal of the American Medical Association* 2003; 289(23):3095–3105.

(315) Kendler KS. Parenting: a genetic-epidemiologic perspective. *American Journal of Psychiatry* 1996; 153(1):11–20.

(316) Wray NR, Pergadia ML, Blackwood DH, Penninx BW, Gordon SD, Nyholt DR et al. Genome-wide association study of major depressive disorder: new results, meta-analysis, and lessons learned. *Molecular Psychiatry* 2012; 17:36–48.

(317) Kirkwood BR, Sterne JAC. Essential medical statistics. 2nd ed. 2003. Oxford: Blackwell Science Ltd.

(318) Costello EJ, Keeler GP, Angold A. Poverty, race/ethnicity, and psychiatric disorder: a study of rural children. *American Journal of Public Health* 2001; 91(9):1494–1498.

(319) Elder GH, Jr, Eccles JS, Ardelt M, Lord S. Inner-city parents under economic pressure: perspectives on the strategies of parenting. *Journal of Marriage and the Family* 1995; 57(3):771–784.

(320) Nazroo JY. Ethnicity, class and health. 2001. London: Policy Studies Institute.

(321) Mishra G, Nitsch D, Black S, De Stavola B, Kuh D, Hardy R. A structured approach to modelling the effects of binary exposure variables over the life course. *International Journal of Epidemiology* 2009; 38(2):528–537.

(322) Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Medicine* 2006; 3(11):2011–2030.

(323) Jensen T. Warmth and wealth: re-imagining social class in taxonomies of good parenting. *Studies in the Maternal* 2010; 2(1):1–13.

(324) Ozer EJ, Fernald LC, Weber A, Flynn EP, VanderWeele TJ. Does alleviating poverty affect mothers' depressive symptoms? A quasi-experimental investigation of Mexico's Oportunidades programme. *International Journal of Epidemiology* 2011; 40(6):1565–1576.

(325) Huston AC, Duncan GJ, McLoyd VC, Crosby DA, Ripke MN, Weisner TS et al. Impacts on children of a policy to promote employment and reduce poverty for low-income parents: new hope after 5 years. *Developmental Psychology* 2005; 41(6):902–918.

(326) Costello EJ, Compton SN, Keeler G, Angold A. Relationships between poverty and psychopathology: a natural experiment. *The Journal of the American Medical Association* 2003; 290(15):2023–2029.

(327) Johnson J. Process of modifying the Rutter Malaise Inventory. Personal communication. 2011.

(328) McKennell A. Attitude measurement: use of Coefficient Alpha with cluster or factor analysis. *Sociology* 1970; 4(2):227–245.

Appendices

Appendix 3.1 The Strengths and Difficulties Questionnaire (SDQ)

For each item (not in the order below) respondents are asked to mark whether the statement is ‘not true’, ‘somewhat true’ or ‘certainly true’, based on the child’s behaviour over the last six months.

Emotional Symptom Scale

Often complains of headaches, stomach aches or sickness
Many worries, often seems worried
Often unhappy, downhearted or tearful
Nervous or clingy in new situations, easily loses confidence
Many fears, easily scared

Conduct Problem Scale

Often has temper tantrums or hot tempers
Generally obedient, usually does what adults request
Often fights with other children or bullies them
Often lies or cheats
Steals from home, school or elsewhere

Hyperactivity Scale

Restless, overactive, cannot stay still for long
Constantly fidgeting or squirming
Easily distracted, concentration wanders
Thinks things out before acting
Sees tasks through to the end, good attention span

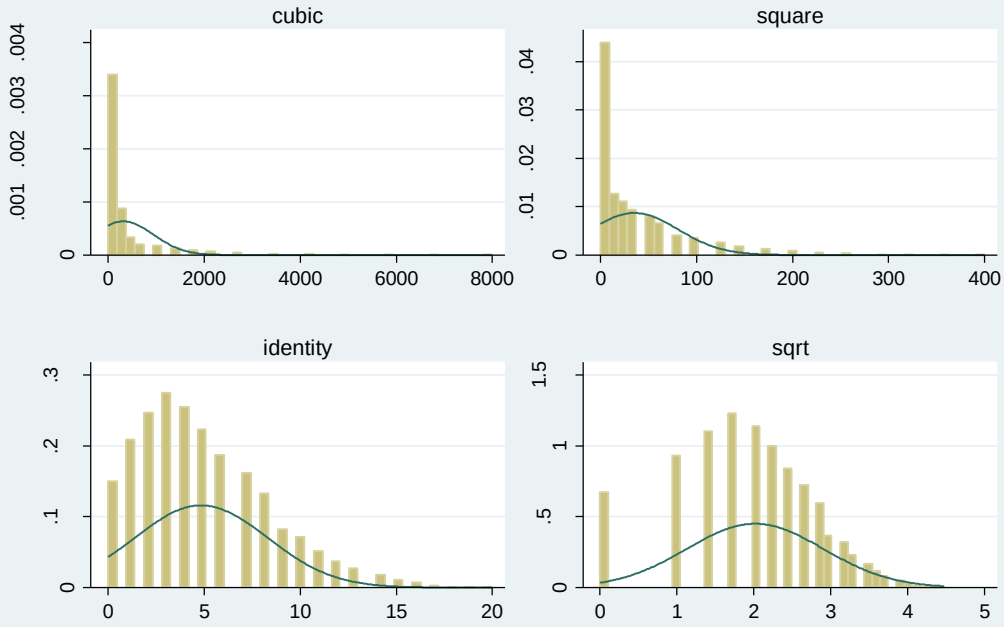
Peer Problems Scale

Rather solitary, tends to play alone
Has at least one good friend
Generally liked by other children
Picked on or bullied by other children
Gets on better with adults than with other children

Prosocial Scale

Considerate of other people’s feelings
Shares readily with other children
Helpful if someone is hurt, upset or feeling ill
Kind to younger children
Often volunteers to help others

Appendix 3.2 Transformations of child externalising behaviour score in the study sample



Appendix 3.3 The construction of the nine-item Malaise Inventory used at MCS1

The nine-item short form was constructed by John Bynner using the items with the highest loadings for the first principal factor in each analysis to identify the sets of items that when aggregated best reflected the Malaise (24-item) score, using results from previous sweeps of NCDS and BCS.[327]

The reliability of the short form was tested with different numbers of items, using Cronbach's alpha coefficient. The aim was to converge on an optimum set of items to achieve a reliability for the short form of at least .70, which is quite adequate for survey analysis purposes.[328]

Malaise Reliabilities (Alpha Coefficients)

	NCDS Age 33	**NCDS Age 37**	**BCS70 Age 26**	**BCS70 Age 21**
24 items	.82	.82	.79	.77
11 items	.79	.79	.76	.74
10 items	.78	.78	.75	.72
9 items	.77	.77	.73	.70
8 items	.75	.75	.72	.70

The selection of items is based on the factor loading for the first principal component of the items. In the 11-item version of the scale, the items are common across all the analyses. In the reduced versions, below 11 and especially below 10, there is increasing instability in the factor loadings. Consequently, different deleted items across the different analyses maintain the maximum reliability of the scale.

Appendix 3.4 Shortened Malaise Inventory (nine-item) and Kessler Six comparison pilot study

During the planning phase of the MCS2 data collection it was decided to change the measure of anxiety/depression from the shortened version of the Rutter Malaise Inventory (nine-item) to another screening questionnaire used in community surveys, the Kessler Six scale. This decision was aided by an evaluative pilot study used to compare these measures and one other measure (results not shown).

For the pilot study a sample was drawn from all the regions of England and a small proportion (6.4%) from Scotland.[235] All respondents were parents of children aged 0–11 years. Participants were recruited as part of the April 2003 NOP Omnibus Survey.

The questionnaires were evaluated in respect of reliability, ROC analyses and intercorrelations.

(i) Reliability

Reliabilities were computed for each scale for the full sample, and separately for women only (the sample of men was considered too small to provide stable results). All three scales showed good to high reliability (see table).

(ii) ROC analyses

ROC analyses were undertaken for each measure, with responses to the question on doctor-confirmed anxiety/depression as the criteria. All three measures performed very similarly: the following table shows areas under the curve, again for the whole sample and for women separately (see table).

(iii) Intercorrelations

Total scores from all three measures were quite highly intercorrelated (see table).

Appendix 3.4 continued

The conclusion from the pilot study was that although the measures tap into different constructs, the shortened Malaise showed very similar psychometric properties to the Kessler Six in this small sample. The decision was made to change this measure for the MCS2 data collection and onwards.

Results of pilot study tests

	All respondents (n=533)	**Women only** (n=336)
Reliability		
Nine-item Malaise	.80	.79
K6	.89	.89
ROC analysis		
Nine-item Malaise	.72	.74
K6	.72	.73
Intercorrelations		
Malaise-K6	.73	.72

Appendix 3.5 Parent-child relationship scale

Please reflect on the degree to which each of the following statements currently applies to your relationship with your child. Using the scale below, circle the appropriate number for each item.

Definitely does not apply 1	Not really 2	Neutral, not sure 3	Applies somewhat 4	Definitely applies 5

1	I share an affectionate, warm relationship with my child	1	2	3	4	5
2	My child and I always seem to be struggling with each other	1	2	3	4	5
3	If upset, my child will seek comfort from me	1	2	3	4	5
4	My child is uncomfortable with physical affection or touch from me	1	2	3	4	5
5	My child values his/her relationship with me	1	2	3	4	5
6	When I praise my child, he/she beams with pride	1	2	3	4	5
7	My child spontaneously shares information about himself/herself	1	2	3	4	5
8	My child easily becomes angry at me	1	2	3	4	5
9	It is easy to be in tune with what my child is feeling	1	2	3	4	5
10	My child remains angry or is resistant after being disciplined	1	2	3	4	5
11	Dealing with my child drains my energy	1	2	3	4	5
12	When my child is in a bad mood, I know we're in for a long and difficult day	1	2	3	4	5
13	My child's feelings toward me can be unpredictable or can change suddenly	1	2	3	4	5
14	My child is sneaky or manipulative with me	1	2	3	4	5
15	My child openly shares his/her feelings and experiences with me	1	2	3	4	5

Key:

	'Openness' or 'positive' items
	'Conflict' or 'negative' items

Source: Pianta, RC. Child-Parent Relationship Scale: Unpublished Measure. 1995, Charlottesville, VA, University of Virginia.

Appendix 4.1 The Bradford Hill Criteria

1: Strength of Association. The stronger the relationship between the independent variable and the dependent variable, the less likely it is that the relationship is due to an extraneous variable.

2: Temporality. It is logically necessary for a cause to precede an effect in time.

3: Consistency. Multiple observations of an association, with different people under different circumstances and with different measurement instruments, increase the credibility of a finding.

4: Theoretical Plausibility. It is easier to accept an association as causal when there is a rational and theoretical basis for such a conclusion.

5: Coherence. A cause-and-effect interpretation for an association is clearest when it does not conflict with what is known about the variables under study, and when there are no plausible competing theories or rival hypotheses. In other words, the association must be coherent with other knowledge.

6: Specificity in the Causes. In the ideal situation, the effect has only one cause. In other words, showing that an outcome is best predicted by one primary factor adds credibility to a causal claim.

7: Dose-Response Relationship. There should be a direct relationship between the risk factor (i.e. the independent variable) and people's status on the disease variable (i.e. the dependent variable).

8: Experimental Evidence. Any related research that is based on experiments will make a causal inference more plausible.

9: Analogy. Sometimes a commonly accepted phenomenon in one area can be applied to another area.

Source: Hill, BA. The environment and disease: Association or causation? *Proceedings of the Royal Society of Medicine* 1965; 58:295–300.

Appendix 5.1 Distribution and tests of association for outcome and main exposures by SEP in boys and girls

SEP	BOYS				GIRLS			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
Total family income								
Highest quintile	*651*	1.3 (0.06)	2.5 (0.11)	4.2 (0.12)	*603*	1.2 (0.07)	2.2 (0.11)	3.2 (0.13)
2nd	*519*	1.2 (0.07)	2.6 (0.13)	4.1 (0.15)	*504*	1.3 (0.07)	2.4 (0.14)	3.4 (0.14)
Middle quintile	*709*	1.5 (0.07)	3.1 (0.13)	4.8 (0.14)	*750*	1.5 (0.07)	3.0 (0.14)	3.7 (0.11)
4th	*738*	1.7 (0.08)	3.5 (0.16)	5.4 (0.15)	*662*	1.6 (0.07)	3.5 (0.17)	4.1 (0.16)
Lowest quintile	*684*	1.8 (0.08)	4.2 (0.21)	5.6 (0.17)	*683*	1.7 (0.09)	4.2 (0.19)	5.0 (0.15)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Below-60%-median poverty								
Above 60%	*2,438*	1.4 (0.04)	2.9 (0.07)	4.5 (0.07)	*2,379*	1.4 (0.03)	2.7 (0.07)	3.6 (0.07)
Below 60%	*863*	1.8 (0.08)	4.0 (0.18)	5.7 (0.15)	*823*	1.7 (0.08)	4.2 (0.17)	4.9 (0.13)
p-value**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Self-rated financial status								
Living comfortably	*889*	1.2 (0.06)	2.4 (0.09)	4.3 (0.11)	*906*	1.2 (0.05)	2.3 (0.09)	3.3 (0.11)
Doing alright	*1,324*	1.3 (0.05)	2.8 (0.09)	4.6 (0.09)	*1,222*	1.3 (0.05)	2.7 (0.10)	3.7 (0.10)
Just about getting by	*811*	2.0 (0.09)	4.0 (0.17)	5.3 (0.15)	*798*	1.7 (0.07)	4.0 (0.15)	4.6 (0.14)
Finding it quite/very difficult	*277*	2.1 (0.11)	4.8 (0.32)	5.8 (0.27)	*276*	2.4 (0.12)	5.2 (0.28)	4.7 (0.22)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Maternal education								
NVQ level 4/5	*1,283*	1.4 (0.05)	2.7 (0.09)	4.1 (0.08)	*1,232*	1.3 (0.05)	2.6 (0.09)	3.2 (0.08)
NVQ level 3	*574*	1.5 (0.09)	3.2 (0.18)	5.0 (0.17)	*527*	1.4 (0.07)	3.0 (0.18)	3.8 (0.16)
NVQ level 2	*950*	1.5 (0.06)	3.2 (0.13)	5.1 (0.12)	*995*	1.6 (0.05)	3.2 (0.12)	4.3 (0.12
NVQ level 1	*225*	1.7 (#)	3.8 (#)	5.7 (#)	*198*	1.8 (0.15)	3.6 (0.28)	4.5 (0.23)
Overseas/other	*43*	1.9 (#)	4.4 (#)	6.1 (#)	*30*	2.1 (0.49)	3.3 (0.68)	4.5 (0.518)
None	*226*	2.1 (0.18)	4.3 (0.34)	6.2 (0.27)	*220*	1.5 (0.12)	4.5 (0.39)	5.3 (0.29)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Housing tenure								
Owner-occupier	*2,336*	1.4 (0.04)	2.8 (0.06)	4.4 (0.07)	*2,244*	1.3 (0.03)	2.6 (0.06)	3.5 (0.07)
Private rental	*212*	1.7 (0.13)	3.8 (0.27)	5.6 (0.30)	*211*	2.0 (0.15)	4.8 (0.34)	4.2 (0.28)
Local authority/social rental	*585*	2.0 (0.11)	4.6 (0.25)	6.2 (0.17)	*599*	2.0 (0.09)	4.4 (0.22)	5.2 (0.18)
Parents/rent-free	*151*	2.1 (0.21)	3.5 (0.38)	5.2 (0.28)	*130*	1.5 (0.19)	3.1 (0.32)	4.6 (0.36)
Other	*17*	1.5 (#)	3.0 (#)	5.0 (#)	*18*	2.6 (#)	4.6 (#)	4.1 (#)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001

*Kruskal-Wallis. ** Wilcoxon. ***Spearman. #Missing (SE) for stratum with single unit.

Appendix 5.1 Distribution and tests of association for outcome and main exposures by SEP in boys and girls, continued

SEP	BOYS				GIRLS			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
Overcrowding								
No (≥1 room p/person)	*3,116*	1.5 (0.04)	3.1 (0.06)	4.7 (0.06)	*3,006*	1.4 (0.03)	3.0 (0.07)	3.8 (0.07)
Yes (< 1 room p/person)	*185*	2.1 (0.19)	4.1 (0.37)	5.6 (0.36)	*196*	1.8 (0.16)	4.0 (0.40)	4.1 (0.23)
p-value**		0.001	0.004	<0.001		0.012	0.002	0.076

*Kruskal-Wallis. ** Wilcoxon. ***Spearman. #Missing (SE) for stratum with single unit.

Appendix 5.2 Distribution and tests of association for outcome and main exposures by SEP in two-parent and single-mother families

SEP	Two parents				Single parent			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
Total family income								
Highest quintile	1,240	1.3 (0.05)	2.3 (0.07)	3.7 (0.10)	14	2.1 (#)	2.8 (#)	4.6 (#)
2nd	1,011	1.2 (0.05)	2.50 (0.09)	3.8 (0.10)	12	1.5 (#)	1.8 (#)	4.6 (#)
Middle quintile	1,381	1.4 (0.05)	3.0 (0.10)	4.2 (0.09)	78	2.0 (#)	3.4 (#)	5.1 (#)
4th	1,274	1.6 (0.06)	3.4 (0.12)	4.7 (0.12)	126	2.2 (#)	4.5 (#)	6.0 (#)
Lowest quintile	758	1.8 (0.08)	4.1 (0.17)	5.1 (0.17)	609	1.8 (0.09)	4.3 (0.21)	5.5 (0.15)
p-value*		<0.001	<0.001	<0.001		0.782	0.051	0.512
Below-60%-median poverty								
Above 60%	4,644	1.4 (0.03)	2.8 (0.05)	4.0 (0.06)	173	2.0 (0.21)	3.7 (0.35)	5.3 (0.29)
Below 60%	1,020	1.7 (0.07)	3.9 (0.16)	5.1 (0.15)	666	1.9 (0.09)	4.3 (0.20)	5.6 (0.15)
p-value**		<0.001	<0.001	<0.001		0.481	0.041	0.142
Self-rated financial status								
Living comfortably	1,721	1.2 (0.04)	2.3 (0.06)	3.8 (0.09)	74	1.5 (#)	3.4 (#)	5.6(#)
Doing alright	2,266	1.3 (0.03)	2.7 (0.07)	4.1 (0.07)	280	1.5 (0.13)	3.2 (0.23)	5.4 (0.26)
Just about getting by	1,284	1.8 (0.06)	3.7 (0.12)	4.7 (0.11)	325	1.9 (0.11)	4.4 (0.26)	5.6 (0.21)
Finding it quite/very difficult	393	2.1 (0.09)	4.9 (0.24)	5.2 (0.20)	160	2.6 (0.19)	5.4 (0.42)	5.4 (0.33)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	0.917
Maternal education								
NVQ level 4/5	2,411	1.3 (0.04)	2.7 (0.06)	3.6 (0.06)	104	1.9 (#)	3.3 (#)	4.3 (#)
NVQ level 3	962	1.4 (0.06)	2.9 (0.14)	4.4 (0.13)	139	1.8 (0.21)	4.5 (#)	5.2 (#)
NVQ level 2	1,631	1.5 (0.05)	3.1 (0.10)	4.6 (0.09)	314	1.9 (0.12)	3.9 (0.25)	5.3 (0.23)
NVQ level 1	310	1.7 (0.12)	3.6 (0.26)	4.9 (0.22)	113	1.9 (#)	4.3 (#)	5.9 (#)
Overseas/Other	64	1.7 (#)	3.3 (#)	4.9 (#)	9	3.2 (#)	7.9 (#)	8.5 (#)
None	286	1.9 (0.15)	4.3 (0.30)	5.3 (0.22)	160	1.8 (0.17)	4.6 (0.50)	6.7 (0.41)
p-value*		<0.001	<0.001	<0.001		0.215	0.502	<0.001
Housing tenure								
Owner-occupier	4,465	1.3 (0.03)	2.7 (0.04)	3.9 (0.06)	115	1.7 (#)	2.8 (0.32)	4.4 (0.32)
Private rental	296	1.8 (0.12)	4.3 (0.26)	4.8 (0.24)	127	1.8 (#)	4.3 (#)	5.3 (#)
Local authority/social rental	743	1.9 (0.09)	4.3 (0.21)	5.5 (0.17)	441	2.0 (0.11)	4.9 (0.23)	6.02 (0.20)
Parents/rent-free	134	1.8 (0.20)	3.6 (0.37)	4.8 (0.36)	147	1.8 (0.19)	3.0 (0.34)	5.1 (0.31)
Other	26	2.0 (#)	3.7 (#)	3.9 (#)	9	2.0 (#)	4.2 (#)	6.4 (#)
p-value*		<0.001	<0.001	<0.001		0.308	<0.001	0.008

*Kruskal-Wallis (X^2). ** Wilcoxon (z). #Missing (SE) for stratum with single unit.

Appendix 5.2 Distribution and tests of association for outcome and main exposures by SEP in two-parent and single-mother families, continued

SEP	Two parents				Single parent			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
Overcrowding								
No (≥1 room p/person)	5,342	1.4 (0.03)	2.9 (0.05)	4.2 (0.06)	780	1.9 (0.08)	4.2 (0.16)	5.5 (0.13)
Yes (< 1 room p/person)	322	1.9 (0.12)	4.15 (0.30)	4.7 (0.23)	59	2.5 (0.45)	3.9 (0.74)	5.9 (0.64)
p-value**		<0.001	<0.001	0.001		0.895	0.944	0.307

*Kruskal-Wallis (X^2). ** Wilcoxon (z). #Missing (SE) for stratum with single unit.

Appendix 6.1 Distribution and tests of association for outcome and main exposures by parenting and emotional support in boys and girls

Parenting and emotional support	BOYS				GIRLS			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
Mother-child relationship score								
1st Tertile	*1,209*	1.1 (0.05)	2.0 (0.09)	3.4 (0.09)	*1,320*	1.1 (0.05)	2.0 (0.08)	2.7 (0.07)
2nd Tertile	*1,079*	1.4 (0.05)	2.9 (0.10)	4.8 (0.09)	*1,046*	1.5 (0.05)	3.0 (0.11)	3.8 (0.10)
3rd Tertile	*1,013*	2.1 (0.07)	4.6 (0.13)	6.5 (0.12)	*836*	1.9 (0.06)	4.6 (0.15)	5.4 (0.14)
p-value***		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Parental warmth								
Yes	*3,184*	1.5 (0.04)	3.1 (0.06)	4.7 (0.07)	*3,086*	1.4 (0.03)	3.0 (0.07)	3.8 (0.07)
No	*117*	1.9 (0.24)	4.7 (0.62)	6.2 (0.43)	*116*	2.1 (0.22)	4.1 (0.51)	5.0 (0.40)
p-value*		0.025	0.003	<0.001		0.002	0.027	<0.001
Parental hostility								
No hostility	2,944	1.5 (0.04)	3.0 (0.07)	4.6 (0.07)	2,999	1.4 (0.03)	3.0 (0.07)	3.8 (0.07)
Hostility	357	1.6 (0.10)	3.7 (0.22)	5.9 (0.20)	203	1.6 (0.15)	3.7 (0.34)	5.3 (0.29)
p-value*		0.217	0.012	<0.001		0.020	0.007	<0.001
Smack child								
Never	*977*	1.4 (0.05)	2.8 (0.11)	3.9 (0.11)	*1,137*	1.3 (0.05)	2.7 (0.10)	3.2 (0.10)
Rarely	*1,729*	1.4 (0.05)	3.1 (0.08)	4.9 (0.09)	*1,681*	1.5 (0.04)	3.1 (0.09)	4.1 (0.09)
Once a month	*212*	1.6 (0.13)	3.3 (0.25)	5.3 (0.23)	*143*	1.5 (0.16)	3.1 (0.35)	3.7 (0.23)
Once a week	*360*	2.0 (0.12)	4.1 (0.25)	6.0 (0.21)	*225*	1.7 (0.12)	4.1 (0.33)	5.1 (0.24)
Daily	*23*	1.8 (#)	4.6 (#)	7.5 (#)	*16*	1.5 (#)	3.7 (#)	5.8 (#)
p-value**		<0.001	<0.001	<0.001		0.003	<0.001	<0.001
Shout at child								
Never	69	1.1 (0.29)	2.6 (0.58)	3.8 (0.50)	97	1.3 (#)	2.3 (#)	2.6 (#)
Rarely	*964*	1.3 (0.05)	2.5 (0.11)	4.0 (0.12)	*1,065*	1.3 (0.05)	2.5 (0.11)	3.3 (0.10)
Once a month	*246*	1.5 (0.12)	3.0 (0.23)	4.2 (0.22)	*280*	1.2 (0.10)	2.4 (0.19)	3.3 (0.16)
Once a week	1,380	1.5 (0.05)	3.1 (0.09)	4.9 (0.10)	1,291	1.5 (0.05)	3.2 (0.10)	3.9 (0.09)
Daily	642	1.9 (0.09)	4.2 (0.22)	6.2 (0.18)	469	1.8 (0.08)	4.3 (0.22)	5.4 (0.18)
p-value**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001

*Kruskal-Wallis. ** Wilcoxon. ***Spearman. #Missing (SE) for stratum with single unit.

Appendix 6.1 Distribution and tests of association for outcome and main exposures by parenting and emotional support in boys and girls, continued

Parenting and emotional support	BOYS				GIRLS			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
No emotional support (9 months)								
Strongly disagree	*1,532*	1.1 (0.04)	2.4 (0.08)	4.2 (0.10)	*1,557*	1.1 (0.04)	2.5 (0.08)	3.4 (0.08)
Disagree	*1,343*	1.7 (0.06)	3.4 (0.10)	5.1 (0.11)	*1,227*	1.5 (0.05)	3.1 (0.11)	4.1 (0.10)
Neither	225	2.2 (0.15)	4.3 (0.28)	5.8 (0.22)	256	2.2 (0.14)	5.0 (0.33)	4.8 (0.25)
Agree/strongly agree	201	3.0 (0.18)	6.1 (0.52)	6.2 (0.27)	162	3.0 (0.21)	5.4 (0.40)	5.1 (0.34)
p-value**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
No emotional support (3 years)								
Strongly disagree	*1,535*	1.2 (0.04)	2.2 (0.07)	4.3 (0.10)	*1,480*	1.2 (0.04)	2.1 (0.07)	3.3 (0.08)
Disagree	*1,317*	1.6 (0.06)	3.5 (0.11)	5.0 (0.10)	*1,260*	1.5 (0.05)	3.2 (0.10)	4.0 (0.10)
Neither	*255*	2.0 (0.12)	4.7 (0.26)	5.7 (0.28)	*270*	2.0 (0.11)	5.0 (0.29)	4.7 (0.23)
Agree/strongly agree	*194*	2.5 (0.20)	6.9 (0.45)	6.5 (0.34)	*192*	2.6 (0.16)	7.2 (0.43)	5.4 (0.31)
p-value**		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Temperament – mood score								
1st tertile	1,437	1.6 (0.05)	3.4 (0.09)	5.0 (0.09)	1,346	1.6 (0.05)	3.2 (0.11)	4.0 (0.10)
2nd tertile	961	1.4 (0.06)	2.9 (0.12)	4.6 (0.12)	941	1.3 (0.05)	3.0 (0.12)	3.7 (0.11)
3rd tertile	*903*	1.4 (0.06)	2.9 (0.14)	4.6 (0.12)	*915*	1.3 (0.06)	2.7 (0.12)	3.6 (0.12)
p-value***		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Temperament – adaptability score								
1st tertile	1,296	1.6 (0.06)	3.2 (0.10)	4.7 (0.10)	1,416	1.6 (0.05)	3.3 (0.11)	4.0 (0.10)
2nd tertile	*1,064*	1.5 (0.06)	3.1 (0.12)	4.8 (0.12)	*1,031*	1.3 (0.05)	2.8 (0.11)	3.7 (0.11)
3rd tertile	*941*	1.3 (0.05)	3.0 (0.12)	4.9 (0.14)	*755*	1.2 (0.05)	2.7 (0.13)	3.7 (0.11)
p-value***		<0.001	0.061	0.720		<0.001	<0.001	<0.001
Temperament – regularity score								
1st tertile	1,016	1.7 (0.07)	3.4 (0.13)	5.2 (0.12)	949	1.7 (0.06)	3.7 (0.14)	4.2 (0.13)
2nd tertile	*1,344*	1.4 (0.05)	3.1 (0.09)	4.7 (0.10)	*1,319*	1.4 (0.04)	2.8 (0.08)	3.7 (0.10)
3rd tertile	*941*	1.4 (0.06)	2.9 (0.12)	4.4 (0.13)	*934*	1.3 (0.05)	2.8 (0.11)	3.6 (0.10)
p-value***		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Post-natal attachment score								
1st tertile	*1,304*	1.9 (0.06)	3.7 (0.12)	5.1 (0.10)	*1,183*	1.7 (0.05)	3.6 (0.11)	4.2 (0.10)
2nd tertile	*1,272*	1.3 (0.04)	2.9 (0.10)	4.7 (0.11)	*1,256*	1.3 (0.05)	2.8 (0.10)	3.7 (0.12)
3rd tertile	725	1.1 (0.05)	2.3 (0.13)	4.2 (0.14)	763	1.2 (0.05)	2.5 (0.15)	3.5 (0.13)
p-value***		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001

*Kruskal-Wallis. ** Wilcoxon. ***Spearman. #Missing (SE) for stratum with single unit.

Appendix 6.2 Distribution and tests of association for outcome and main exposures by parenting and emotional support by family structure

Parenting and emotional support	TWO-PARENTS				SINGLE-MOTHER			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	**n**	Mean (SE)	Mean (SE)	Mean (SE)
Mother-child relationship score								
1st Tertile	*2,260*	1.1 (0.03)	2.0 (0.06)	3.0 (0.06)	*269*	1.5 (0.15)	2.4 (0.23)	3.8 (0.20)
2nd Tertile	*1,868*	1.4 (0.04)	2.9 (0.07)	4.2 (0.08)	*257*	1.8 (0.13)	3.7 (0.27)	5.0 (0.23)
3rd Tertile	*1,536*	1.9 (0.05)	4.4 (0.10)	5.8 (0.10)	313	2.3 (0.14)	6.0 (0.29)	7.4 (0.25)
p-value***		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Parental warmth								
Yes	*5,490*	1.4 (0.03)	2.9 (0.04)	4.1 (0.06)	*780*	1.9 (0.08)	4.0 (0.16)	5.4 (0.14)
No	*174*	1.9 (0.21)	4.1 (0.51)	5.3 (0.32)	*59*	2.5 (#)	5.6 (#)	6.9 (#)
p-value**		0.007	0.010	<0.001		0.060	0.071	0.008
Parental hostility								
No hostility	5,236	1.4 (0.03)	2.9 (0.05)	4.1 (0.05)	707	1.9 (0.08)	4.0 (0.19)	5.3 (0.13)
Hostility	428	1.5 (0.09)	3.5 (0.21)	5.4 (0.18)	132	2.1 (0.25)	4.9 (0.50)	7.1 (0.45)
p-value**		0.080	0.020	<0.001		0.327	0.051	<0.001
Smack child								
Never	*1,822*	1.3 (0.04)	2.7 (0.08)	3.4 (0.08)	*292*	1.8 (0.14)	3.4 (0.28)	5.0 (0.24)
Rarely	*2,988*	1.4 (0.04)	2.9 (0.06)	4.4 (0.07)	*422*	1.9 (0.10)	4.2 (0.25)	5.4 (0.20)
Once a month	*319*	1.5 (0.10)	3.0 (0.18)	4.5 (0.17)	*36*	2.1 (#)	5.7 (#)	6.2 (#)
Once a week	*504*	1.8 (0.10)	3.9 (0.22)	5.4 (0.16)	*81*	2.1 (#)	5.6 (#)	7.5 (#)
Daily	*31*	1.7 (#)	4.0 (#)	7.1 (#)	*8*	1.3 (#)	5.4 (#)	5.6 (#)
p-value*		<0.001	<0.001	<0.001		0.236	<0.001	<0.001
Shout at child								
Never	142	1.1 (0.18)	2.3 (0.32)	2.9 (0.29)	24	2.2 (#)	3.5 (#)	4.5 (#)
Rarely	*1,740*	1.2 (0.04)	2.4 (0.08)	3.5 (0.08)	*289*	1.7 (0.13)	3.4 (0.27)	4.6 (0.23)
Once a month	*486*	1.3 (0.07)	2.6 (0.14)	3.7 (0.14)	*40*	1.9 (#)	4.3 (#)	4.5 (#)
Once a week	2,388	1.5 (0.04)	3.1 (0.07)	4.3 (0.07)	283	1.9 (0.13)	3.9 (0.26)	5.7 (0.25)
Daily	908	1.8 (0.07)	4.0 (0.17)	5.7 (0.14)	203	2.2 (0.17)	5.7 (0.40)	7.0 (0.28)
p-value*		<0.001	<0.001	<0.001		0.003	<0.001	<0.001

*Kruskal-Wallis. ** Wilcoxon. ***Spearman. #Missing (SE) for stratum with single unit.

Appendix 6.2 Distribution and tests of association for outcome and main exposures by parenting and emotional support by family structure, continued

Parenting and emotional support	TWO-PARENTS				SINGLE-MOTHER			
		Maternal psychological distress		*Externalising behaviour*		*Maternal psychological distress*		*Externalising behaviour*
		9 months	3 years	5 years		9 months	3 years	5 years
	n	Mean (SE)	Mean (SE)	Mean (SE)	n	Mean (SE)	Mean (SE)	Mean (SE)
No emotional support (9 months)								
Strongly disagree	*2,874*	1.1 (0.03)	2.4 (0.05)	3.7 (0.06)	*215*	1.2 (0.10)	3.2 (0.26)	4.8 (0.26)
Disagree	*2,200*	1.6 (0.04)	3.2 (0.08)	4.5 (0.08)	*370*	1.7 (0.13)	3.7 (0.25)	5.4 (0.20)
Neither	360	2.1 (0.11)	4.6 (0.24)	5.1 (0.20)	121	2.5 (0.21)	4.9 (0.49)	5.9 (0.36)
Agree/Strongly agree	230	3.0 (0.16)	5.5 (0.38)	5.2 (0.28)	133	3.1 (0.21)	6.5 (0.58)	6.7 (0.44)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	0.002
No emotional support (3 years)								
Strongly disagree	*2,760*	1.2 (0.03)	2.1 (0.05)	3.7 (0.07)	*255*	1.4 (0.13)	2.5 (0.20)	4.8 (0.23)
Disagree	*2,218*	1.5 (0.05)	3.3 (0.08)	4.4 (0.08)	*359*	1.9 (0.14)	3.7 (0.25)	5.2 (0.20)
Neither	*421*	1.9 (0.09)	4.7 (0.21)	4.9 (0.19)	*104*	2.2 (#)	5.5 (#)	6.9 (#)
Agree/Strongly agree	*265*	2.5 (0.17)	6.8 (0.41)	5.8 (0.28)	*121*	2.7 (0.22)	7.8 (0.65)	6.4 (0.42)
p-value*		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Temperament - Mood score								
1st Tertile	2,429	1.6 (0.04)	3.2 (0.07)	4.4 (0.08)	354	2.1 (0.15)	4.6 (0.30)	5.7 (0.19)
2nd Tertile	1,660	1.3 (0.04)	2.9 (0.08)	4.0 (0.09)	242	1.7 (0.15)	3.6 (0.30)	5.4 (0.28)
3rd Tertile	*1,575*	1.3 (0.04)	2.7 (0.09)	3.9 (0.09)	*243*	1.8 (0.14)	4.2 (0.32)	5.4 (0.27)
p-value***		<0.001	<0.001	<0.001		0.017	0.031	0.059
Temperament - Adaptability score								
1st Tertile	2,323	1.6 (0.04)	3.1 (0.08)	4.2 (0.08)	389	2.2 (0.13)	4.5 (0.27)	5.5 (0.20)
2nd Tertile	*1,858*	1.4 (0.04)	2.9 (0.08)	4.1 (0.09)	*237*	1.8 (0.13)	3.9 (0.30)	5.5 (0.26)
3rd Tertile	*1,483*	1.2 (0.04)	2.8 (0.09)	4.2 (0.10)	*213*	1.6 (0.14)	3.8 (0.31)	5.6 (0.32)
p-value***		<0.001	<0.001	0.059		<0.001	<0.001	0.756
Temperament - Regularity score								
1st Tertile	1,631	1.6 (0.05)	3.4 (0.10)	4.6 (0.10)	334	2.2 (0.13)	4.5 (0.28)	5.7 (0.21)
2nd Tertile	*2,377*	1.4 (0.04)	2.8 (0.06)	4.2 (0.08)	*286*	1.6 (0.12)	3.8 (0.29)	5.1 (0.23)
3rd Tertile	*1,656*	1.3 (0.04)	2.7 (0.09)	3.8 (0.09)	*219*	1.8 (0.16)	4.1 (0.32)	5.8 (0.29)
p-value***		<0.001	<0.001	<0.001		<0.001	0.152	0.002
Postnatal attachment score								
1st Tertile	*2,181*	1.8 (0.04)	3.5 (0.08)	4.5 (0.08)	*306*	2.5 (0.16)	5.0 (0.29)	5.8 (0.23)
2nd Tertile	*2,209*	1.2 (0.04)	2.7 (0.07)	4.1 (0.09)	*319*	1.6 (0.12)	3.8 (0.26)	5.7 (0.23)
3rd Tertile	1,274	1.1 (0.04)	2.3 (0.09)	3.7 (0.11)	214	1.5 (0.13)	3.5 (0.37)	4.7 (0.24)
p-value***		<0.001	<0.001	<0.001		<0.001	<0.001	<0.001

*Kruskal-Wallis. ** Wilcoxon. ***Spearman. #Missing (SE) for stratum with single unit.