The Contribution of Child Behaviour Problems to the Health of Caregivers

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Abstract

Caregivers of children with health problems have been demonstrated to show poorer physical and psychological health than caregivers of healthy children. It has been suggested that child behavioural problems are key and account for a large proportion of the variance in caregiver health. Currently, the relation between behaviour problems and caregiver health remains unclear. We conducted a meta-analysis and a secondary data analysis using national data to describe and compare the associations between internalizing and externalizing behaviour problems and caregiver health. Meta-analytical results suggest an association between child behaviour problems and parental stress, depression, and presence of psychiatric symptoms. National data analyses suggested an important association between child behaviour problems, particularly externalizing behaviour problems, and caregiver physical and psychological health when accounting for socioeconomic variables. Results suggest mothers may be more impacted than fathers, and that externalizing behaviour problems may contribute to bigger caregiver health effects than internalizing behaviour problems.

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CHAPTER 1: INTRODUCTION

Parenting is a daunting and demanding task, especially for those who must care for a child with health problems[1]. Parents of these children are more likely to incur increases in medical costs[2,3], time constraints[4], employment constraints[5,6], lower incomes[5,7], and child care challenges[8]. For example, in the United States (U.S), it has been estimated that caring for a child with a chronic health problem can cost families up to 20 times more than the average expense for caring for a child[3]. Furthermore, the recent push towards enabling the family to provide as much of the care as possible at home adds an additional burden on families by further placing the impetus of care on the family unit[9]. The additional resources needed to care for a child with health problems (e.g. time and money) creates important challenges for these parents (i.e. caregivers). Interestingly, the population based literature has mostly focused on the effect on mothers, and few or none of the studies have focused on paternal effects of caring for a child with health problems.

The challenges faced by caregivers of children with health problems can be exemplified through stories in the media. A recent event concerns an Ontario mother abandoning her developmentally disabled son at a provincial office, as she reportedly didn't have the resources or the physical energy required to take care of him anymore[10]. This way, she ensured her son would enter government care, which she believed was better for him as she felt she could not take care of him anymore. Another example of caregiver burden is the case of Robert Latimer[11] who, faced with the constant pain and suffering of his severely disabled daughter, decided to end her life. While these are extreme examples, they highlight the difficulties faced by caregivers and the lengths some feel they need to go to in order to obtain

the support they need. In these cases, their role as child caregivers affects their own physical and psychological health.

Caregiver health:

The challenges faced when caring for a child with health problems can take their toll on caregiver psychological health. It has been shown that compared to parents of healthy children, parents of children with health problems show generally poorer psychological health, including elevated stress[12-15], lower sleep quality[16], more risk of suffering from burnout[17], and higher levels of depression[1, 18-22]. Most of the work done to date has measured the impact on caregiver psychological health.

Nevertheless, there is a growing body of literature that supports the notion that caregivers of children with health problems also demonstrate poor physical health[1, 7, 18, 21, 23, 24, 25]. For example, these caregivers have been shown to be twice as likely to suffer from activity limitations and chronic health problems compared to caregivers of healthy children[18]. One particular study investigated the association between child health problems and caregiver physical health[26]; however, caregiver physical health was measured prior to the classification of child health problems at age 2. Nevertheless, the associations noted were based on diagnostic clusters using ICD codes, and associations were found with many markers of physical health, such as obesity, musculoskeletal symptoms, lower back pain, acute sprains, and acute lower respiratory infections[26]. While the body of evidence is still growing, the literature is starting to suggest that the consequences of caring for a child with health problems is not limited to psychological health outcomes, and that negative physical outcomes may also be experienced.

The observed psychological and physical health effects observed on caregivers seem to worsen based on the complexity of child impairment[1]. That is, the more severe is the child's condition, the more caregiver physical and psychological health may be affected. Furthermore, the extent to which caregiver's health effects are temporary or long lasting is not clear. One study attempted to investigate the pattern of the caregiver health effect over time[1] and found that rate of deterioration of caregiver health was constant over time.

On the other hand, some studies have shown positive effects of caring for children with health problems. For example, studies have shown that after the initial news of the diagnosis, parents of children with cancer or diabetes see their anxiety or distress decrease over time rather than stay at the same levels as during the time of diagnosis[27, 28]. Other studies have also shown a decrease in anxiety and depression, as well as satisfaction related to caring for a child with health problems[29, 30, 31]. Finally, there is some evidence that involving families in decision making regarding the care of their child leads to an increase in satisfaction with health services received[32].

Defining child health problems:

The challenge of defining child chronic health problems lies in grouping together conditions that are expected to have common effects on the caregivers. For example, health problems may include learning disabilities, behavioural problems, and chronic physical disabilities, which all may act upon the caregiver differently. A recent systematic review on definitions of chronic child health conditions revealed that the prevalence of chronic child health conditions can vary from 0.22% to 44% depending on the definition used[33].

An operational definition of child health problems for usage with population level data has been put forward by Kohen et al. (2007)[34], in which they define child health problems as either having a chronic condition, a severe health difficulty, an activity limitation, or a condition requiring elevated service use[34]. Chronic conditions are described through a parent reported chronic conditions checklist. Activity limitations describe children's difficulties in performing usual levels of activity. A severe health condition is identified through the use of the Health Utilities Index[35]. Finally, elevated service use indicates individuals who use more medicine and require more medical/special care than average children due to their condition. According to Kohen et al., (2007)[34], if a child is classified by more than 1 indicator, it may be an indicator of a complex or severe health condition.

Factors influencing caregiver health:

Considering the challenges that caregivers face, efforts have been made to understand the range of factors that influence caregiver health. Many potential variables that can play a role on caregiver physical and psychological health have been identified: socio economic status (SES), child behaviour, child function, caregiving demands, perception of formal care, self-perception, social support, family function, stress management, child vulnerability, maternal adjustment, attitude towards the child, parental belief system, marital satisfaction, religiosity, psychosocial family resources and social network[23, 24, 36-44].

Different models may elucidate the processes by which child health problems are related to caregiver health. The stress process model[45] describes how life events (involuntary sources of stress that unbalance the individual, such as becoming the caregiver of a child with a

health problem or unforeseen economic problems) and chronic life strains (constant sources of stress, such as the caregiving role over time) negatively act upon the caregivers' self-concept (how they view themselves and how they feel they have control of the caregiving situation), therefore making them more vulnerable to suffer from stress related issues.

Karasek's[46] job strain model was specifically developed for the workplace; however, the caregiving role can be viewed as a job. The model explains that a job can have either high or low demands (workload), as well as either high or low latitude (freedom in choosing how to do and when to do these demands). The model posits that low latitude and high demands lead to mental strain and job dissatisfaction[46], which can impact caregiver health. Since the role of caring for a child with health problems can be seen as having high demands and low latitude, it is likely to create high strain in the caregiver.

Appendix A presents a theoretical model proposed by Raina et al.[44], which describes factors that have been posited to have both a direct and indirect effect on caregiver health[44] in the context of a stress process. For example, a child's level of function is expected to act directly upon caregiver health, but also indirectly by impacting caregiver demands, which then impacts social support, which then impacts caregiver health. Notably, this model posits a direct effect of child behaviour problems on psychological health.

While the Raina et al.[44] model posits directionality to relationships between variables consistent with caregiver health as an outcome rather than a predictor, we cannot discount the possibility of a bi-directional or inversely directional relationship. In describing the process of model development, they note this issue, and state that in the case of evidence of

bi-directional relationships, they opted to stress the directionality most consistent with a causal model of caregiver health. As such, the model explicitly excludes other potentially important relationships between variables. For example, it is also possible that the parent's poor health favours the manifestation of child behaviour problems. Nevertheless, the posited model was clear in its hypotheses regarding how each variable relates to each other, and so we choose to investigate this proposed relationship.

The Impact of Child Behaviour Problems:

Of the factors influencing caregiver health, it has been suggested that child behavioural problems are key and account for a large proportion of the variance in caregiver mental health[44, 47]. Child behaviour problems have been shown to impact parental stress[48, 49], presence of psychiatric symptoms[50, 51], and depression[21, 52]. Caring for a child with behaviour problems seems to affect many aspects of the caregiver's psychological health. Furthermore, there is some evidence of the impact of caring for a child with behaviour problems on caregiver physical health as well[21].

Pathways through which child behaviour problems may impact the caregiver are described in the Raina et al. (2004)[44] model as well as by Lach et al. (2009)[21]. Directly, caring for a child with behaviour problems may lead to increased stress. However, we can also theorize indirect effects. For example, caring for a child with behaviour problems can add additional pressures on the family. Since often one of the parents (in 90% of the cases, the child's mother[1]) has to provide additional care to the child, including increased medical appointments, that parent may not necessarily be able to hold a full time job[2,5,7]. This, in turn, could contribute to lower family income which, when combined with higher medical costs,

can put the family at an economic disadvantage. That is, caring for a child with behaviour problems could lead to lower income which then could lead to increased stress or depression. The consequences of caring for a child with behaviour problems can lead, both directly and indirectly, to poorer caregiver physical and psychological health.

History of Child Behaviour Terminology:

Prior to 1968, child psychopathology was only given two categories in the Diagnostic and Statistics Manual[53] (DSM)[54]. Noting this lack of clarity/detail, Achenbach (1966)[55] provided one of the first attempts at empirically classifying child psychiatric disorders. Through factor analyses, he identified two major principal factors labeled as "Externalizing" and "Internalizing", applicable to both sexes, which he conceptualized as being independent of one another. That is, a child could present both internalizing and externalizing symptoms. Furthermore, he identified subsequent specific subscales which resembled psychiatric symptoms seen in adults, such as depression and anxiety. That is, these subscale measures were more representative of specific conditions (e.g. anxiety, depression) rather than representing commonalities within different psychopathologies (e.g. "internalizing", "externalizing").

The decade following the publication of the DSM-II[56] saw an increase in interest in child psychopathology, with Achenbach & Edelbrock (1978)[54] saying "... the time has come for standardization of instruments and methods of analysis across studies" (p.1296). At the same time, Achenbach proposed a new measure, which he dubbed the Child Behaviour Check List (CBCL)[57]. Six different versions of the CBCL were originally developed, corresponding sex (male and female) by three age groups(ages 4 to 5, 6 to 11, and 12 to 16 years old)[57]. As with

his previous research, the CBCL measured both "externalizing" and "internalizing" behaviour problems under a subscale he named "Broad-band behaviour-problem scales"[57] (p.28). Achenbach (1978)[57] also distinguished his broad-band behaviour problems scales with "Narrow-band behaviour-problem scales" (p.29) which were more specific to certain psychopathologies rather than general behaviour problems. That is, the narrow-band behaviour problems were more condition specific and represented conditions that could be found inside one of the broad-band scales.

According to the Achenbach terminology, externalizing behaviour problems (EBP) are overt in nature and include different behaviours such as aggression, impulsivity, hyperactivity, and disobedience[58, 59]. They have been defined as "problems of conflict with the outside world"[57] (p. 29). Internalizing behavioural problems (IBP), in contrast, are less obvious to external observers and cover a broad range of emotional problems such as anxiety and depression[59]. They have been defined as "problems primarily within the self"[57] (p.29).

The CBCL remains one of the most widely used child behaviour problem rating measures[60]. It has been validated many times[61, 62], and in other cultures[63, 64]. Currently, the CBCL has two different versions, one for pre-schoolers (ages 1 ½ - 5), and another for children aged 6 – 18[65]. Both questionnaires are completed by the parents, but there are also teacher and youth versions[65]. Other more recent measures, such as the Strength and Difficulties Questionnaire (SDQ)[66] and the Behaviour Assessment System for Children 2 (BASC-2)[67] have appeared since the creation of the CBCL. The SDQ is also posited to contain two "Broad-band" general scales, representing internalizing and externalizing behaviour problems[68]. Through a meta-analysis, the SDQ was directly compared to the

CBCL for screening efficiency; both measures were deemed to perform equally well in identifying children with behaviour problems[62]. Finally, Achenbach & Dumenci (2001)[69] also provided a DSM-IV[70] list of disorders that are consistent with items on the CBCL. These diagnosis scales are currently: depressive problems, anxiety problems, somatic problems, attention deficit/hyperactivity problems, oppositional defiant problems, and conduct problem[71].

We considered how internalizing and externalizing behaviour problems might be expected to vary in terms of their associations with caregiver health. Research supports the idea that externalizing behavioural problems are associated with both caregiver physical health[72] and psychological health[58, 72-74]. Furthermore, internalizing behavioural problems have been demonstrated to also be associated with caregiver psychological health[73, 75], such as parental distress[73]. It has also been established that internalizing behavioural problems affect the psychological health of the mothers more than the fathers[75].

Current Limitations of the Literature and Need for More Research:

To date, there has only been one effort at empirically summarizing the caregiver health effect through a systematic review[76]. This study did note an association between child behaviour problems and caregiver health. However, it has focused on families in which the child had cancer and as such did not look at the association of child behavior problems in the general population on caregiver health. Due to the limited scope of this single systematic review, the current literature does not allow us to infer or draw general conclusions regarding associations between caregiver health and child behaviour problems. Thus, a meta-analysis of the literature is warranted.

A range of issues necessitate a systematic review of the effect of child behavior problems on caregiver health. The literature addressing the association between caregiver health and child behaviour problems is mixed, with some studies noting significant effects of child behaviour problems on caregivers[1, 18, 21] and other noting lack of a significant effect[77, 78]. A systematic review would help clarify the overall relationship between caregiver health and child behaviour problems. Furthermore, only one paper has examined the impact of caring for a child with behaviour problems on caregiver physical health outcomes. Therefore, there is a need to further clarify the effect of child behavior problems on caregiver physical outcomes. Finally, a systematic review allows us to examine the how internalizing and externalizing behaviour problems differ in their association with caregiver physical and psychological health.

In addition to a systematic review, research using population data is needed for multiple reasons. First, the literature on an association between child behaviour problems and caregiver health has mostly focused on psychological health. There is a need to further explore the potential association between child behaviour problem and caregiver physical health. Second, few studies investigate associations using non-categorical population level data. That is, few studies investigate the impact of broadly defined behaviour problems / child health conditions on caregiver health and instead focus on the association of a specific child health condition (e.g. ADHD) and caregiver health. Third, the different impacts externalizing behaviour problems and internalizing behaviour problems can have on caregiver physical and psychological health needs to be further examined; little research has explored the impact of internalizing behaviour problems on caregiver physical health.

Finally, population level data would allow us to control for many demographic factors (e.g. Socio-economic status (SES), marital status, income) which could be related to child behaviour status and caregiver health.

Thesis objectives and research question:

Our main objective is to better understand the association of child behavioural problems on caregiver physical and psychological health. To this end, this study has two specific objectives. The first is to conduct a SR and meta-analysis to summarize literature regarding the contribution of behavioural problems to caregiver health. The second objective is to examine empirically the contribution of externalizing child behavioural problems and internalizing child behavioural problems to caregiver physical and psychological health using a longitudinal nationally representative sample of Canadian children.

We hypothesize that child externalizing behaviour problems will be associated with a larger overall health effect on parents than child internalizing behaviour problems, as these behaviour problems create a bigger caregiving challenge. That is, the "problems of conflict with the outside world"[57] (p.29) present among all externalizing behaviour problems are posited to create a bigger issue for the caregivers as they are concrete conflicts with the child that can lead to poorer health. Internalizing children are not expected to have the same level of concrete conflict with their caregiver, and so we expect the caregiver health effect to be bigger for caregivers of children with externalizing behaviour problems.

The two research questions are:

1. *"Do caregivers of children with internalizing and / or externalizing behavioural problems demonstrate poorer physical and psychological health compared to caregivers of healthy children?"*
2. *"What effects do child internalizing and externalizing behavioural problems have on caregiver physical and psychological health in a national sample of Canadian children?"*

In sum, many factors have been suggested to impact caregiver health[44]. Of these, child behaviour problems have been suggested as a key contributor[44, 47]. Currently, there have been few efforts in summarizing the impact of child behaviour problems on caregiver physical and psychological health, and even fewer attempts at disentangling the effects of externalizing behaviour problems compared to internalizing behaviour problems. The current project proposes to summarize the current literature using meta-analytical methods, as well as provide insight regarding the effects of different child behaviour problems on caregiver health using population level data.

CHAPTER 2: METHODS

We first consider methods for our national data analyses, followed by the methods for our systematic review and meta-analysis.

National Data Analyses

National Data Analyses Objective:

The goal of the national data analyses was to compare parents of children with behaviour problems with parents of children with health problems and parents of healthy children in terms of physical health and psychological health, when controlling for other important socioeconomic factors. Because of a relative lack of data on paternal outcomes, we further explored differences between effects on mothers and effects on fathers.

Data source:

The National Longitudinal Survey of Children and Youth (NLSCY) was a representative Canadian national study that drew information on Canadian children[79]. Within its framework, the NLSCY followed a longitudinal cohort of children who were aged 0-11 years old at the first cycle of data collection in 1994/1995 through to 2008/2009[80]. Its longitudinal component included over 22 000 children[79]. The study was conducted by both Statistics Canada and Economic Social Development Canada (formerly known Human Resources Development Canada) biennially from 1994 to 2009, for a total of 8 cycles of data. The sample included households across all Canadian provinces and territories, and was representative of each regional population (i.e. households were deemed to be a good approximation of other households in the region); excluding children who lived either within

institutions or on Indian reserves[81]. Data from territories were never released, and as such are unavailable for analyses.

Participants were asked to identify the person most knowledgeable (PMK) about the child to complete the survey, of which the majority were biological mothers (89.88% at cycle 1)[82]. We consider the PMK to also be the child's primary caregiver, and they will be referred to as caregivers throughout the text. Other caregivers can be identified in the child's life (e.g. grandparents, teachers), but we decided to focus on primary caregivers, as identified through PMK status.

For the purposes of this study, both a caregiver questionnaire and a child self-report questionnaire were utilized. Throughout the whole study, caregivers were asked to fill a questionnaire biennially, containing information on both them and their child. Starting at ages 10 to 11, children themselves were asked to fill a self-report questionnaire, which they were allowed to complete following parental consent. Within the child self-report questionnaire, items forming the different behaviour scales were asked when the child was from 10 to 15 years old.

The variables used from the caregiver questionnaire included demographic information (on the caregiver and their child (e.g. Caregiver and child age and gender)), information about caregiver self-reported health and depression scores, along with their relationship to the child, income, marital status and education. The variables used from the child self-report questionnaire were the items that formed the child behaviour scale, specifically from the

following subscales: hyperactivity / inattention, emotional disorder / anxiety, conduct disorder, indirect aggression, and property offences.

Child Health Measures:

Child Physical Health. Two separate measures were utilized to assess child physical health. We utilized the activity limitation and chronic condition indicators proposed by Kohen et al., (2007)[34]. Several reasons motivated our use of these health indicators. First of all, using these indicators provides for a definition that is not condition specific. It focuses on the potential impact on the caregiver rather than the child's specific health condition. Second, it can be applied broadly on population data as the presence of these indicators are often measured in surveys (e.g. in the National Longitudinal Survey of Children and Youth[79]). Finally, the four indicators have been employed in other child surveys using national samples[83, 84]. Using the described indicators[34], it has been estimated that up to 26% of Canadian children present some kind of health problem[18].

1) Activity limitations were measured using 5 items; with one question asking previously identified children as having asthma about restriction of their activities due to the condition ("Does this condition (asthma) or health problem prevent or limit his/her participation in school, at play or any other activity normal for a child his/her age?") and 4 questions asking whether they were limited overall or at specific locations ("Does your child have any difficulty hearing, seeing, communicating, walking, climbing stairs, bending, learning or doing any similar activities?", "Does a physical condition or mental condition or health problem reduce the amount or the kind of activity your child can do: At home?", "…: At work or at school?", "…:in other activities, for example, transportation or leisure?". An

indication of yes for any of these questions resulted in the child being classified as having an activity limitation, similar to the approach used previously by Brehaut et al., (2009)[18].

2) Chronic conditions were classified based on 16 yes/no questions which assessed the presence of: food or digestive allergies, respiratory allergies, other allergies, bronchitis, diabetes, heart condition or disease, epilepsy, cerebral palsy, kidney condition, mental handicap, learning disability, attention deficit disorder (with or without hyperactivity), emotional / psychological / nervous difficulties, eating disorders, autism, and migraines.

Children who were classified as having both an activity limitation and a chronic condition were classified as having physical health problems. Children classified as having a health problem with two or more indicators have been shown to typically demonstrate the poorest health overall[34]. Furthermore, combining both chronic conditions and activity limitations creates a subsample of children who likely have a chronic condition with a disability and are likely to have an impact on their day to day lives and thus on the lives of their caregiver.

Behaviour Problems. Within the NLSCY, starting at cycle 4[85], child behaviour problems were assessed using 31 items divided into 5 different subscales: 1) Indirect Aggression (5 items), 2) Emotional Disorder and Anxiety (7 items), 3) Conduct Disorder and Physical Aggression (6 items), 4) Hyperactivity and Inattention (7 items), and 5) Property offences (6 items). Each item was coded on a 3 point scale, answered with the following: “Never or not true” (0), “Sometimes or somewhat true” (1), and “Often or very true” (2). The total of all items in a subscale gave us the subscale score, where a higher score indicated the presence of the behaviour.

Child internalizing behaviour problems were assessed by the "Emotional Disorder and Anxiety" subscale. Examples of items measured by this subscale are: "I am unhappy or sad", "I am not as happy as other people my age", and "I am too fearful or nervous".

Child externalizing behaviour problems were assessed by the 4 remaining subscales. These items, excluding the ones on emotional disorder / anxiety and property offences subscales, have been used in the past with parent reported data[21] to identify children with externalizing behaviour problems. Examples of items measured by these subscales are: "I am impulsive, I act without thinking", "I physically attack people", "I threaten people", and "When I am mad at someone, I say to others: Let's not be with him/her".

The scores on each subscale were used to classify children with or without internalizing or externalizing behaviour problems. Children were defined as having any externalizing behaviour problem if they scored 2 or more standard deviations above the mean on any of the externalizing behaviour problem subscales, as others have done[21]. We utilized the same criterion for internalizing behaviour problems. To be classified as having both behaviour problems, a child had to be 2 standard deviations above the mean on any externalizing subscale and 2 standard deviations above the mean on the internalizing subscale.

Child Health Condition Groups. Based on the previous child health condition information, we classified children as belonging to one of 6 different health groups: 1) Physical health problems + any behaviour problem (either internalizing or externalizing), 2) Physical health problems only, 3) No physical, but both an externalizing and internalizing behaviour

problem, 4) No Physical, but Externalizing behaviour problem only, 5) No Physical, but Internalizing behaviour problem only, and 6) Healthy.

These groupings were created in order to assess the potentially different impact that the two types of behaviour problems may have on caregivers, and also to comparatively assess the impact of a child behaviour problem compared to a physical health condition on caregiver physical and psychological health.

Child General Health. Child general health was measured using a single 5 point scale item in which caregivers rated their child's health as one of the following: 1) Excellent, 2) Very Good, 3) Good, 4) Fair, 5) Poor. As per previous research using the NLSCY[1, 21, 34], because the data for this variable are non-normally distributed, the response categories were dichotomized as child health being either (1) Excellent / Very Good or (2) Good / Fair / Poor.

Caregiver Health Measures and Outcomes:

Caregiver General Health. Caregiver physical health was measured using a single self-reported 5 point scale item in which caregivers rated their own health as being one of the following: 1) Excellent, 2) Very Good, 3) Good, 4) Fair, 5) Poor. This variable was dichotomized as per the child general health variable.

Caregiver Psychological Health. Caregiver depression was measured using a shorter version of the Centre for Epidemiological Studies' Depression scale[86]. It contained 12 items,

which had 4 different categories of responses for each item, for a maximum score of 36. Higher scores meant there were more manifestations of depressive symptoms.

Caregiver Demographics. Five variables were examined relating to caregiver demographics: gender (male/female), age (in years at time of interview), household income (self-reported), education (having completed high school vs. not), and marital status (married vs. not). The income variable represents caregiver reported annual household income. We then dichotomized this variable into caregivers in low-income families vs. the rest. This was done utilizing the NLSCY's suggested low-income cut-offs[85]. The education variable measures the highest level of schooling obtained, with the 5 possible responses ranging from "Less than secondary" to "College or university degree (including trade)". This was dichotomized to high school and above vs. less than high school. Finally, we also assessed the current relationship / marital status of caregivers. We dichotomized the responses to "Married" (either married or common-law) vs. "Unmarried" (single, divorced, widowed or separated).

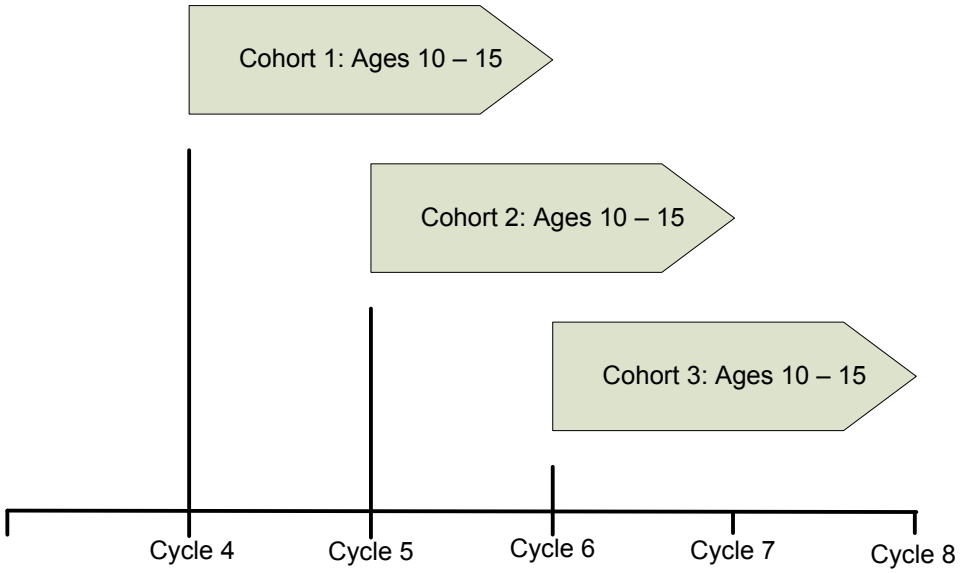
Cohort Selection:

Figure 1 presents which children, and of which ages, were selected at each cycle to create our cohort. Availability of data and consistency of questionnaires strongly influenced our cohort selection. Through the 8 cycles of data collection, some of the child self-report scale items changed. Between cycle 3 and 4, one item for the "Anxiety and Emotional Disorder" subscale ("I feel miserable, unhappy, tearful, or distressed", an internalizing behaviour problem indicator) and one item of the "Hyperactivity / Inattention" subscale ("I fidget", an externalizing behaviour problem indicator) were deleted. In order to ensure consistency in

our identification of child behaviour problems, we restricted our cycles of data to cycle 4 through 8. As mentioned previously, child self-reported behaviour was only available from ages 10 to 15, so this is the group we focused on.

Two different datasets were built, one cross-sectional and one longitudinal. The cross-sectional dataset only contained children from cycle 6, as it was the cycle with the most available children aged 10 - 15. It was used to assess overall impact of child health classification on caregiver health. The longitudinal dataset allowed us to select 3 separate cohorts of children. They were each followed from age 10 - 11 at their baseline cycle (either cycle 4, 5 or 6) to age 14 - 15 at their final cycle (either cycle 6, 7 or 8). In order to ensure a sufficient sample size for our analyses, we combined children from the three separate cohorts into one single group of 10 – 11 year olds followed until age 14 – 15. Cohort analyses determined whether assembling these three sub cohorts was warranted.

Figure 1: Cohort Selection Across Cycles of Data Collection



Children were deleted from the study for one of two reasons. 1) Children with missing child health condition classification at baseline, either due to non-response of withdrawal from the study, were deleted as this was our main exposure variable. 2) One child per household was randomly chosen where applicable, as to not count the same caregiver more than once. To do so, we first selected children that were classified under one of the 6 child health conditions, and if more than one child was classified we randomly selected from them one child per household. Child health classification was prioritized to favour the inclusion of children with health or behaviour problems (the less frequent classifications) for the purpose of sample size. The following classifications were prioritized from most important to least important, respectively: 1) Chronic condition and any behaviour problem, 2) both behaviour problems, 3) internalizing behaviour problems, 4) chronic condition, 5) externalizing behaviour problems, 6) healthy.

Data Analyses:

Prior to the investigation of our final sample, two sets of analyses were performed to determine cohort effects and the impact of missing data on child health classification. We first conducted cohort effect analyses in order to determine whether underlying differences between the cohorts were likely to bias our results. We then analyzed the differences between children with missing classification data and those without missing classification. Both these analyses were done on the same covariates: child age, child gender, child general health, caregiver age, caregiver gender, income, education, self-reported health, and depression.

We then computed baseline descriptive statistics on both caregivers and their children. Child variables included age, gender, and self-reported health, while caregiver variables included age, gender, income, education, marital status, working status, self-report health and depression. ANOVAs were used for comparing continuous data, adjusting for multiple comparisons using Duncan's method[87]. Chi-square tests were computed for categorical variables. Multiple chi-square test comparisons were adjusted using the Bonferonni method[88]. Effect sizes were calculated for each variable, using eta-squared for ANOVA's and Cramer's V for chi-square. These descriptive statistics were computed for all children aged 10 to 11 years old and their caregiver. For Cramer's V, effect sizes of <.1 were considered small, <.3 were considered medium, and <.5 were considered large[89]. For eta-squared (n^2), effect sizes of <.01 were considered small, <.06 were considered medium, and <.14 were considered large[90].

To assess the associations between child health conditions and caregiver health, we conducted a series of multiple regression analyses. The first model only looked at the effect of child health group on caregiver physical (self-reported health) and psychological (depression) health. The second model adjusted for child age and gender, as per the meta-analysis. Due to the availability of the data within the NLSCY, the final model further adjusted for caregiver age, gender, income, education, and marital status. When examining depression, linear multiple regression models were used. When examining general health, the outcome was dichotomized into "Excellent or Very Good" health vs. "Good, Fair, or Poor" health, and logistic regression models were used. Both cross-sectional and longitudinal analyses used standardized beta coefficients[91] (multiple regression) and odds ratios (logistic regression) to assess the impact of each variable on the measured outcome. For longitudinal

analyses, indicator measures were compared across the three time points (age 10-11, age 12-13, age 14-15) to examine changes. Standardized beta coefficients, significance, and R-square are reported for linear multiple regression models. Odds ratios, significance, and R-square are reported for logistic regression models. All analyses were conducted using SAS version 9.2.

Systematic Review and Meta-Analysis

The PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) Statement reporting guidelines were used during the preparation of descriptions of the methods and findings associated with the systematic review conducted as part of this thesis[92]. These guidelines were developed to maximize the transparency and completeness of reports describing systematic reviews.

Systematic Review Objective:

The goal of this systematic review was to compare parents of children with behaviour problems and parents of healthy children in terms of 1) physical health and 2) psychological health. We also attempted to assess differences between effects on mothers and effects on fathers. Prior to commencing our review, we developed a protocol for this work which was followed throughout the review process. The protocol was developed with support from experts in the areas of parent health in relation to child health (JB, DK, RA, KC), systematic reviews and meta-analyses (BH, DF), large database research (JB, DK, RA), and psychology (JB, DK, KC).

Electronic Literature Search:

In collaboration with an experienced information specialist, we developed an electronic search strategy to identify articles providing empirical evidence about the comparison of caregivers of children with behaviour problems and caregivers of healthy children on parental physical and psychological health (Appendix B). Our search incorporated the following electronic databases: Medline, Embase, PsycInfo, CINAHL, and Sociological Abstracts. All searches were conducted from January 1978 until February 2013. The original search strategy was developed in Medline, after which a librarian developed translations for the remaining four databases. We based our search strategy on three major themes: 1) Caregivers, 2) Child, and 3) Child Behaviour Problems. Outcomes were not included as part of our search strategy in order to ensure we found studies addressing the broadest possible representation of the impact of child behaviour problems on caregiver health.

Child behaviour problems were defined, for the purposes of the search, by symptoms most commonly associated with internalizing and externalizing behaviour problems. To do so, we extracted the most common subscales from three widely used scales: the CBCL[57], the SDQ[66], and the BASC-2[67]. For internalizing behaviour problems, the most common subscales were: anxiety, depression, somatization (when someone manifests physical health symptoms of bad health, but the causes of which are not physical), and social problems. For externalizing behaviour problems, the most common subscales were: hyperactivity, aggression, conduct problems, and delinquency. Furthermore, we also used the DSM-oriented subscales identified in the CBCL[71] and assigned them as representing internalizing behaviour problems (depression, anxiety, and somatic problems) and externalizing behaviour problems (ADHD, opposition defiant disorder, and conduct problems). Finally, we studied search strategies utilized by previous meta-analyses that identified internalizing and

externalizing behaviour problems[75, 93]. These subscales and conditions were matched to the most representative MeSH term found in each database. We further searched for the words internalizing or externalizing appearing within 4 words of child or adolescent as well as an overall "child behaviour disorder" MeSH term.

We chose 1978 as the start date for the search informing this systematic review since that was the year in which Achenbach (1978)[57] published the "Child Behaviour Check List", whose importance was discussed in Chapter 1. Works published prior to this would be more likely to be different in their conceptualization of child behaviour problems. As such, studies would not necessarily refer to the same concepts, and could thus have potentially measured highly variable concepts of child behaviour problems.

Study Eligibility Criteria:

Both the abstract screening and the full-text screening used a set of inclusion criteria developed by the research team (MC, JB, DK). Our set of inclusion criteria was applied in full during the full text screening, while a subset thereof was used for the screening of abstracts. This approach was used to be broadly inclusive in the identification of potentially relevant studies during the process of abstract screening. The full listing of inclusion criteria was as follows, with those marked with an asterisk representing the subset that was used for the screening of abstracts:

1- The study involved human participants.*
2- The article provided empirical data from a research study described in a complete journal article (i.e. commentaries, letters, reviews, published abstracts, were excluded) and did not focus on retrospective reports of the subject's childhood.*
3- The study was written in either French or English.

4- The caregiver(s) in the study was (were) the parent(s) or informal cargiver(s) of the child.
5- The "cared for" (i.e. children) were between 2 and 18 years of age.*
6- The study had an a priori group definition of "Parents of children with a health condition", meaning that the investigators specified which groupings they were studying before assessing differences. Examples of something we don't want are prospective cohorts, where parents are measured on an outcome throughout the study period, at the end of which they verify which children had behaviour problems.*
7- The child's behaviour problem is clearly defined as either Internalizing or Externalizing, or it falls in a diagnostic category associated with internalizing or externalizing behaviour problems, as per our definition in Chapter 2.*
8- The hypothesis leading to the study groups was about child behaviours and not caregiver outcomes or characteristics.
9- The study assessed a caregiver physical or psychological health outcome of interest to the review (e.g. self-reported health, GHQ scores, depression scores, anxiety).*
10- The caregiver outcomes were assessed quantitatively, in a way that allowed for an effect size estimation of the differences in impact on caregiver health (e.g. odds ratios, t-tests, analyses of variance, chi-square tests).
11- The study matched our framework and purpose in terms of studying the effects of child behaviour problem status on parent health. Examples of designs that would not match our framework include those where the groupings are not applicable (e.g. Gene presence vs. Gene absence), or those where the caregiver outcome was present before the child behaviour problem was measured (e.g. prenatal and perinatal depression).*
12- There was a proper control group that allowed for contrast between Internalizing vs. Externalizing, Internalizing vs. healthy, or Externalizing vs. healthy. Healthy was considered to be children without internalizing or externalizing behaviour problems. An example of a study not meeting eligibility criteria would be one which compared children with ADHD to children with a more severe form of ADHD without any other control group, as this study would only be providing information on an Externalizing vs. Externalizing comparison.*

The set of eligibility criteria is complex, and some clarifications are worthwhile.

Regarding criterion 4, since we posit that a chronic exposure to a child's behaviour problems may solidify the association with CG health over time, we ensured that the caregivers in the study had to either be the parents of the child or an informal caregiver (e.g. aunt and uncle, foster family, etc.), which are expected to devote a significant portion of their times to child-rearing and child care. No studies evaluating the health of professional caregivers (e.g. nurses) were considered.

Regarding criterion 5, the child had to be between 2 to 18 years of age, as previously done[75]. Furthermore, prior to age 2, behaviour problems are difficult to classify and the parent's exposure to behaviour problems before that age would be hard to measure.

Regarding criterion 6, the included studies had to specify which groups they were interested in before assessing the differences.

Regarding criterion 7, child behaviour problems were defined using the most common subscales of the CBCL[57], SDQ[66], and BASC-2[67] along with DSM equivalents[71], as described above.

Regarding criterion 8, the groupings of the exposure and control groups had to have been done on the basis of child condition (e.g. internalizing behaviour problems) rather than parent outcome (e.g. depression). For example, studies which split the groups into "Parents with depression" and "Control parents" rather than "Parents of children with externalizing behaviour problems" and "Parents of children without externalizing behaviour problems" were excluded. We took this position in order to limit confounding and the likelihood that the observed association was due to child behaviour rather than parent outcomes present prior to the child behaviour problem. Child behaviour problems were defined as per our criteria above.

Regarding criterion 10, caregiver outcomes had to be assessed quantitatively, in a way that would allow us to assess differences in physical and psychological symptoms between

the different groups. Analyses were deemed sufficient if they provided us with the mean, standard deviation, and total number of participants per group if it was a continuous outcome measure. For dichotomous outcome measures, we required the report to provide us with the number of patients with the event per group and the total number of participants per group. Data on correlations and regressions were not collected. Furthermore, the caregiver outcome had to be measured either after or at the same time that it was determined that the child had a behaviour problem, since we posit that it is the behaviour problem that affects caregiver health. For example, if a study looked at the odds of parents having a physical health problem at the time of their child's birth, and determined behaviour problems when the child was 6 years old, the study was excluded as the caregiver outcome was measured before the child assessment of behaviour problems. However, if another study measured both the caregiver outcome and child behaviour problem status at the same time, it would be included as it remains possible that the behaviour problem was present before the caregiver condition was measured.

Finally, regarding criterion 12, the study had to have a control group that would allow us to assess the differences in associations with caregiver health for caregivers of children with externalizing behaviour problems compared to a control, internalizing behaviour problems compared to a control, or externalizing behaviour problems compared to internalizing behaviour problems. For example, if the study only provided a total behaviour problem score or if it compared children with the same type of behaviour problem, the study was excluded given that it would not allow us to look at the differences between these groups.

Study Selection:

As no exclusions were planned to be made on the basis of caregiver outcomes, we chose to use a sensitive search strategy rather than a specific one. A sensitive search strategy is more likely to include the abstracts of studies which are relevant to your objectives, while a specific search strategy is more likely to exclude the abstracts of studies that aren't relevant. In order to capture as many relevant articles as possible, the conservative approach was favoured.

Three levels of screening were used to review the identified citations. The first step was a screening of the titles of the citations identified by the search, where one reviewer sought to retain only citations whose titles were judged to be possibly relevant to the review's objectives. More specifically, the citation's title needed to mention both child behaviour problems and parent health. After the title screen, abstracts of the retained citations were screened for inclusion. Finally, once the set of potentially relevant abstracts was identified, a full-text screen determined final inclusion in the review.

For stage 1 title screening, one reviewer (MC) assessed all titles identified by the electronic literature search. Any study that was judged potentially relevant based on the article title was retained. That is, if an article had no chance of containing empirical data (e.g. commentary), or it was clearly not about caregivers or children (e.g. animal study), these articles were excluded. Where this was unclear, the citation was carried forward to abstract screening.

Stage 2 screening of abstracts was carried out by three reviewers (MC, KC, EH); research staff of the Ottawa Hospital Research Institute's Clinical Epidemiology Program). At this

stage, each article was assigned a random unique identifying number to sort articles randomly in order to ensure that screening would not be affected by year of publication or author names.

Reviewers were instructed to record the first reason for exclusion encountered for each abstract. The first reviewer (MC) did the abstract screening on all abstracts. The second and third reviewers each reviewed a portion of the set of abstracts such that all abstracts were reviewed by two individuals. All disagreements were resolved through consensus meetings until a final set of articles was decided upon for full text screening.

The full text screen was performed by the same three reviewers. The same approach to screening was used through application of the inclusion criteria outlined in the previous section, creating two full sets of screening responses on all articles. Disagreements were again resolved through consensus meetings until a final set of articles was identified. A PRISMA[92] flow diagram documenting the results from the process of study selection is provided in Chapter 3.

Data Extraction:

Appendix C presents the list of the 41 different variables that were extracted. Basic identifying information including study authorship, year of publication, article title, journal edition and so forth were imported directly into our primary database Reference Manager 12.0. Data extraction was performed using a standardized form implemented in Microsoft Excel 2007, and was piloted on a set of 10 articles to ensure no important information was omitted, and also to ensure consistency of use across data collectors. Data extraction of

included studies was independently performed by two reviewers (MC and KC). All discrepancies were resolved through discussion.

Six different categories of variables were collected: groups and sample size, caregiver demographic variables, child demographic variables, subgroup and comparison information, outcome measurement and values, and quality assessment.

Groups and Sample Size. Information was collected on the total number of groups, and on how many of these groups were exposure or control groups. Criteria for each study's healthy controls were also recorded. For every included exposure and control group, sample sizes were recorded.

Caregiver Demographic Variables. Demographic information was extracted for caregivers of children forming our exposure and control groups, where available. Caregiver education, socioeconomic status (SES), ethnicity, age, and gender were recorded. If a study measured outcomes on both the mother and the father, separate demographic information was recorded for each parent.

Child Demographic Variables. Basic demographic information (child age and child gender) was extracted for children forming our exposure and control groups, where available.

Subgroup and Comparison Information. For each study, we identified which caregiver's (mother, father, or "parent" (no gender or conflicting gender information)) outcomes were

reported. Furthermore, binary variables were employed to inform us regarding which comparisons were found within the study (e.g. caregivers of children with externalizing behaviour problems vs. caregivers of healthy children).

Outcome Measurement and Values. Information was collected regarding all caregiver physical and psychological health outcomes. Firstly, we recorded which outcomes were measured, how they were measured (e.g. self-reported, validated scale), and the name of the measure used, if applicable. For continuous outcomes, means and standard deviations for each exposure group were recorded; we sought change scores from baseline to follow-up where available, however in practice findings were not reported this way. Summaries of the authors' conclusions from statistical analyses were also recorded. Finally, tests used by study authors as well as statistical adjustment (if any) were recorded.

Quality Assessment. At the end of data extraction, quality assessment scores were assigned, based on a modified Downs & Black (1998)[94] scale and additional study information collected which is described in the following section.

Risk of Bias Assessment of Included Studies:

The risk of bias of included studies was assessed using a scale which consisted of core items from the Downs & Black scale (1998)[94] as well as additional criteria we felt to be vital to our research questions. This approach was chosen for several reasons. First, no relevant risks of bias measures of observational psychological studies were found. Second, the Downs & Black scale (1998)[94] was shown in a systematic review to be one of the best quality assessment tools[95]. Finally, while the Downs and Black scale (1998)[94] would be appropriate,

many of its items weren't applicable to our specific context since the scale itself mostly focused on medical concepts. Concerns have been raised over the scale's external validity[96]. We therefore modified the Downs and Black (1998)[94] scale to suit our present purposes, removing items we judged to lack relevance to the context of our research question. This included questions such as the following: "Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?" "Have all important adverse events that may be a consequence of the intervention been reported?".

Appendix D presents the quality assessment scale that we used. Items we have added, along with their definitions, are marked by an asterisk. While items judged irrelevant were removed, a small number of new items were added based on the beliefs of participating experts (JB, DK) as to their importance in caregiver health research. Items were also added based on importance for meta-analysis of observational research, once again based on expertise (BH). These items attempted to address key issues in observational child and parent health research not found in other scales. Examples of added items include: "How is child condition reported (Parent report, clinical diagnosis, taken from database)?" and "Did authors use matching to minimize the effects of confounding?".

The custom scale's scores ranged between 0 (poorest study quality) to 17 (highest study quality), where the presence of each criterion attributed 1 point to the study. Two areas: "Exposure definition" (measuring outcomes firmly (e.g. with biological markers) or softly (e.g. with psychometric scales)) and "Outcome assessment" (assessing child behaviour status through scale or diagnosis) were allowed a maximum score of 2.

The risk of bias assessment was used to develop understandings of both the differences within the set of included studies as well the current methodological limitations of the literature. Results from risk of bias assessment were summarized narratively to provide insights regarding the internal validity of the evidence base studied. Studies were rated by one reviewer (MC).

Analysis:

Prior to performance of meta-analyses, summary tables providing an overview of study characteristics were reviewed with our content experts to ensure studies were sufficiently homogenous to be synthesized. Meta-analyses were performed using Review Manager 5.2 software. Three different types of comparisons were assessed across multiple outcomes: Caregivers of children with externalizing behaviour problems vs. Caregivers of healthy children, Caregivers of children with internalizing behaviour problems vs. Caregivers of healthy children, and Caregivers of children with externalizing behaviour problems vs. Caregivers of children with internalizing behaviour problems.

We planned to perform meta-analyses using standardized mean difference as the summary outcome measure[97] to assess differences between exposure groups. The standardized mean difference method makes the effect estimate in each study relative to its extent of variability, presumes between-study differences in the size variability are related to the measurement scales used rather than differences in study populations, and enables users to synthesize data for outcomes assessed using different measurement tools[97]. This approach was favoured because we expected the scales used for measurement of our outcomes of interest to vary across studies. According to Faraone (2008)[98], effect sizes for SMDs can be

interpreted in a manner equivalent to that described for Cohen's d statistic[90]. Therefore, SMD values of 0.2, 0.5 and 0.8 can be considered to represent small, moderate and large effect sizes, respectively. Odds ratios were used as summary measures for dichotomous outcome data. Across both continuous and dichotomous outcomes where study estimates were from multivariable analyses, we also summarized which covariates each study adjusted for statistically. Random effects inverse variance models were used for all meta-analyses[99]. All summary estimates from meta-analyses were reported along with corresponding 95% confidence intervals and results have been presented using forest plots.

Statistical heterogeneity was assessed using the I^2 statistic[100]. For each comparison with a high amount of heterogeneity (considered to be an I^2 of 50% or more)[101], the characteristics of the papers included were again inspected to determine the potential source of the heterogeneity. Sensitivity analyses exploring the exclusion of outlier studies were also explored where rationale for differences between studies became apparent. If possible based on the presence of sufficient studies and completeness of covariate information, meta-regression analyses[102] were also to be explored using Comprehensive Meta-Analyst Software (Version 2.2) to study the impact of potentially important study covariates including average child age, proportion of male children, caregiver age, proportion of female caregivers, and socioeconomic status. In practice, given the paucity of studies and mixed reporting of study covariates, meta-regressions were mostly not feasible.

To the extent possible as determined by how included studies reported their findings, each outcome was also considered separately in subgroup analyses for three different respondent groups: mothers, fathers, and parents. The "parents" group represents studies for which the

gender of the group of caregivers was either unclear or mixed (e.g. 75% of the respondents were mothers). This was done in order to assess potential caregiver differences in the manifestation of health outcomes.

Finally, when a study had multiple exposure groups, data was entered within the meta-analysis by splitting the control group in two (or more) equal groups. For example, if a study studied children with Attention Deficit Hyperactivity Disorder (ADHD) (n = 50) and children with ADHD + Oppositional Defiant Disorder (ODD) (n = 50) compared to health children (n = 100), we would include both groups in the meta-analysis and split the control group in two so that the meta-analysis would include one comparison for children with ADHD (n = 50) with healthy children (n = 50) and one comparison for children with ADHD + ODD (n = 50) with healthy children (n = 50).This method is detailed within the Cochrane Handbook[101].

CHAPTER 3: RESULTS

Section 1 present results relating to the national data analyses. First, we describe how the cohort was developed through preliminary analyses assessing the impact of cohort effects and missing health classification data. Further, we investigate the stability of our child health classification over time and present our final cohort and sample size. Finally, we explore the impact of child health classification on caregiver health through logistic and multiple regression models for all children aged between 10 – 15, and then separately for children aged 10 – 11, 12 – 13, and 14 – 15.

Section 2 presents results from the systematic review and meta-analyses. We start by exploring the associations between externalizing and internalizing conditions with caregiver health relative to caregivers of healthy children, and we then directly compare the associations with caregiver health between child externalizing and internalizing conditions. In each comparison, we discuss findings from primary meta-analyses as well as those from additional subgroup analyses.

National Data Analyses

Preliminary Analyses:

Cohort Effects

Table 1 describes three subcohorts based on demographic and health variables, for both caregivers and their children. Three cohorts of children were used in order to obtain enough child-caregiver pairs for each of our child health diagnoses of interest. We explored age,

gender, and general health of children and their caregivers, as well as income, education, and depression for the caregivers. ANOVAs and chi-square analyses were performed for continuous and categorical data, respectively. Results suggest differences in income between cohorts 1 and 3, and 2 and 3. Cohort 2 children were reported as significantly healthier than cohort 1 children. Furthermore, caregivers were significantly different on physical health, with caregivers of cohort 1 self-reporting poorer health than cohorts 2 and 3, and on psychological health with caregivers of cohort 1 being more depressed than caregivers of cohort 2 and 3 and caregivers of cohort 2 being more depressed than of cohort 3.

Despite being statistically significant, these cohort differences were typically small (range $n^2 = <0.001$ to 0.066, V = 0.008 to 0.045), with the exception of income which had a medium effect size ($n^2 = 0.066$)**.** As income typically increases over time due to cumulative job experience, this was expected. Considering the small effect size of these cohort differences (noted by n^2 for continuous variables and V for dichotomous variables, found under the same column), combination of the different cohorts was not expected to heavily bias our analyses. We therefore were justified in pooling the data of children of the same ages at different time points, resulting in one large cohort of children aged 10 – 15, described by the 'overall' column in Table 1.

Table 1 :Cohort Effects

Characteristics	Overall	Cohort 1	Cohort 2	Cohort 3	df	F / X^2	n^2 / V (Effect Size*)
Sample Size (%)	**7430 (100)**	**2696 (36.29)**	**2461 (33.12)**	**2273 (30.59)**			
Child characteristics							
Age	10.48	10.49	10.47	10.49	2	0.66	<.001
Female, %	49.52	49.63	48.61	50.40	2	1.46	0.014
General Health, % (Excellent or Very Good)	88.88	87.78[b]	89.59[a]	89.36	2	4.68	0.026
Caregiver characteristics							
Age	40.03	40.05	39.95	40.09	2	0.42	<.001
Female, %	91.22	91.25	90.93	91.51	2	0.48	0.008
Income ($)	75 414	71 948[c]	72 975[c]	82 232[ab]	2	23.40*	0.066
Education, % (High school or above)	89.12	89.65	89.19	88.42	2	1.81	0.016
General Health, % (Excellent or Very Good)	69.86	67.07[bc]	71.58[a]	71.23[a]	2	14.39	0.045
Depression	3.88	4.26[bc]	3.84[ac]	3.50[ab]	2	12.34*	0.004

Superscripts indicate significant differences with the value of the associated column. The "Overall" column was not used for differences testing.

* For Cramer's V, effect sizes of <.1 were considered small, <.3 were considered medium, and <.5 were considered large[89]. For eta-squared, effect sizes of <.01 were considered small, <.06 were considered medium, and <.14 were considered large[90].

Missing Data Analysis:

In order to explore whether children with missing health condition information differed from other children, we performed missing data analyses. Table 2 describes these analyses. We explored whether these children significantly differed on the same demographic and general health variables as above. We were able to assess the health of children who were missing health condition information, as child health was assessed as part of the caregiver questionnaire, while the child's condition information was part of a self-reported questionnaire given to the children. Statistically significant differences were found on child age, child gender, child health, caregiver income, caregiver health, and caregiver depression,

with parents of children with missing condition data reporting being more depressed, unhealthy, young, poor, and less educated than their counterparts. Children classified as missing health information were younger, not as healthy, and more likely to be male. However, considering most of the effect sizes for the differences were very small (range n^2 = <0.001 to 0.006, V = 0.002 to 0.067)), it is unlikely that removing these children would have a significant effect on our overall conclusions.

Table 2 : Missing Data Analysis

Characteristics	Missing	Healthy or Health Condition	df	F / X^2	n^2 / V (Effect Size)*
Sample Size (%)	**1926 (25.92)**	**5504 (74.08)**			
Child characteristics					
Age	10.44	10.49	1	16.19*	0.002
Female, %	43.44	51.26	1	29.95*	0.065
General Health, % (Excellent or Very Good)	84.76	89.95	1	31.01*	0.067
Caregiver characteristics					
Age	39.96	40.05	1	0.32	<0.001
Female, %	91.31	91.20	1	0.02	0.002
Income ($)	72 945	76 121	1	3.97*	0.006
Education, % (High school or above)	88.05	89.42	1	2.33	0.018
General Health, % (Excellent or Very Good)	66.92	70.65	1	7.68*	0.033
Depression	4.45	3.73	1	22.57*	0.003

* For Cramer's V, effect sizes of <.1 were considered small, <.3 were considered medium, and <.5 were considered large[89]. For eta-squared, effect sizes of <.01 were considered small, <.06 were considered medium, and <.14 were considered large[90].

Stability and Change of Child Health Conditions:

Table 3 presents the stability of child health classification over the three follow-up periods. As we were classifying children based on their baseline data (at age 10 and 11), we wanted investigate whether the classifications were consistent over time by comparing child health classification between each follow-up period and over the course of the entire

longitudinal follow-up. Most children did not report the same health condition over time. For example, only 9.62% of children classified as having only a chronic condition at baseline were reported as having only a chronic condition at the 2 remaining time points (age 12-13 and age 14-15). Our data seem to suggest that health conditions are more stable over shorter periods of time. When only looking at the stability of child health conditions across two cycles, between 23.85% and 28.13% of children with a chronic condition only remained classified as such at the following cycle.

Table 4 presents the number of children who went from any unhealthy classification (i.e. any classification but the "healthy" one) to a healthy classification over the three follow-up periods. While children may not be classified in the identical category over time, they can still have another health condition that could affect their caregiver's health. Therefore, we investigated how many children's health classifications change from "Unhealthy" to "Healthy" at subsequent cycles. Between each cycle, the percentage of children that went from any health condition to being healthy ranged from 42.02% to 50.04%. However, the number of children with a health condition at any cycle ranged from 21.2% to 23.1%. This demonstrates that while many children seem to go from health problem to healthy, just as many children go from healthy to having a health problem. This indicates two possibilities: 1) behaviour problems and activity limitations are highly fluid and likely to change often over time and based on time of assessment (e.g. the child can be having a "good day" or a "bad day" on the day of the survey), and 2) methods used to identify child health problems were not reliable. While we cannot entirely discount the second possibility, the methods we employed have been used elsewhere[1, 21]. As such, even if not consistent over time, these child health classifications may impact caregiver health. Considering the percentage of

children with health problems at each time point were similar, we still have sufficient sample size to investigate potential differences in the associations between behaviour problems and caregiver health at different child ages.

Sample Size and Child Health Classification:

Table 5 describes sample sizes per age group and per cycle. Final sample sizes were obtained after deletion of children with missing health classifications (n = 1 926) followed by the random deletion of siblings, as detailed in chapter 2 (n = 872). Each child was followed for three cycles, going forward. The colours represent which cohort the child belongs to, with light gray being the first cohort, grey the second, and dark grey the third. We further subdivided them in the following age groups as each child was surveyed every 2 years and this allowed for longitudinal evaluation of the associations.

Our first cohort of children was aged 10 – 11 at Cycle 4 of data collection (2000 – 2001). Of the 1 600 surveyed at ages 10 – 11, 1 199 remained at ages 14 – 15. The second cohort of children was aged 10 – 11 at cycle 5 of data collection (2002 – 2003). Initially, 1 510 children were assessed at those ages, of which 1 156 provided information at cycle 7 (2006 – 2007), when they were 14 – 15 years old. Finally, children aged 10 – 11 at cycle 6 (2004 – 2005) represented our third cohort. Of the 1 522 children initially assessed, 1 174 remained at the last cycle of data collection (2008 – 2009). Our final sample contained 4 632 unique child/caregiver pairs.

Table 3 : Child Health Classification Stability Across Longitudinal Time Points

Health Classification	% Stability Across Whole Study Period	% Stability From Time 1 to Time 2	% Stability From Time 2 to Time 3
Chronic condition + Either child behaviour problem	14.89 (14)	37.23 (35)	26.38 (19)
Chronic conditions + activity limitation	9.62 (25)	23.85 (62)	28.13 (63)
Both child behaviour problems	N/A	S	9.68 (6)
Externalizing behaviour problem	5.22 (27)	18.57 (96)	31.64 (118)
Internalizing behaviour problem	N/A	6.03 (7)	15.00 (9)
Healthy	48.00 (1709)	67.47 (2402)	70.33 (2058)

Table 4 : Number of Children Whose Classification Changes from Unhealthy to Healthy Across Longitudinal Time Points

Health Classification	% Change from Time 1 to Time 2	% Change from Time 2 to Time 3	% Change from Time 1 to Time 3
Chronic condition + Either child behaviour problem	21.28 (20)	19.44 (14)	24.47 (23)
Chronic conditions + activity limitation	44.23 (115)	41.52 (93)	45.77 (119)
Both child behaviour problems	41.67 (35)	41.94 (26)	57.14 (48)
Externalizing behaviour problem	54.16 (280)	43.70 (163)	57.45 (297)
Internalizing behaviour problem	63.79 (74)	61.02 (36)	42.24 (49)
Total	48.97 (524)	42.02 (332)	50.04 (536)

Table 5: Sample Size for Each Cohort at Baseline and Subsequent Cycles of Data Collection*

	Cycle 4	Cycle 5	Cycle 6	Cycle 7	Cycle 8
Age 10 – 11	1600	1510	1522	n/a	n/a
Age 12 – 13	n/a	1244	1217	1256	n/a
Age 14 – 15	n/a	n/a	1199	1156	1174

Table 6 presents each child's health classification at baseline. Most children were classified as healthy (76.9%). Within the non-healthy classifications, child externalizing behaviour problems (11.2%) and child chronic condition (5.6%) were the most common. Children presenting both externalizing and internalizing behaviour problems were the least common (1.8%).

Table 6: Unweighted Sample Size per Child Health Group

Health Condition	Sample Size (%)	Cumulative Sample Size
Physical health problems + any behaviour problem	94 (2.0%)	94
Physical health problems only	260 (5.6%)	354
No physical, but both an externalizing and internalizing behaviour problem	84 (1.8%)	438
No Physical, but Externalizing behaviour problem only	517 (11.2%)	955
No Physical, but Internalizing behaviour problem only	116 (2.5%)	1071
Healthy	3561 (76.9%)	4632

Overall Descriptives:

Table 7 presents caregiver and child characteristics for all child health condition groups at baseline (ages 10 – 11). Overall, most children were reported as having excellent or very good health (89.66%), while 50.54% of the 4632 children were female. Child age varied little, as the group only contained children aged 10 – 11. Amongst all different health condition classifications, children were most commonly categorized within the "healthy" group (76.9%).Caregivers were mostly female (91.57%), had a mean age of 40.06 years, and most had completed their high school education (89.25%). Most were married (83.20%), and working (79.24%). Most caregivers reported their health as excellent or very good (69.43%).

We further explored child and caregiver differences between each child health condition group. Children classified as having any condition other than healthy or with internalizing behaviour problems were less frequently female (%female range 25.15% – 42.54%). Children with both internalizing and externalizing health conditions were substantially more frequently male (74.85%). Child health was reported as excellent or very good most often for children classified as healthy (91.6%). For children classified with any health condition, excellent or very good health reports varied (range 68.48% - 90.87%), with children with chronic conditions being the least often rated as having excellent or very good health (68.48%).

Caregiver age significantly differed across groups. Mean caregiver age across health groups ranged from 39.33 to 41.35 years old. The vast majority of caregivers were female (Range 87.86%-94.64%). Average income was $75 583, with significant differences between the income of caregivers of healthy children ($77 396) and caregivers of children with a chronic condition and a behaviour problem ($63 043). Fewer caregivers of children with both behaviour problems (83.06%) and caregivers of children with externalizing behaviour problems (85.20%) completed high school than caregivers of healthy children (90.22%). Caregivers of children with internalizing behaviour problems were the least likely to be married or common-law (69.17%) and these caregivers differed significantly from most other caregivers of children with other health condition (Range 79.02%-84.35%). Working status varied little, except for being significantly lower among caregivers of children with both chronic conditions and a behaviour problem (69.00%) and caregivers of children with a chronic condition only (71.93%). Wide variations were present for caregiver self-reported

health. Caregivers of children with chronic conditions (with or without behaviour problems) were the least likely to report excellent or very good health (48.31% and 51.95%, respectively), and caregivers of healthy children the most likely to do so (71.87%). These differences were significant ($p < .05$). Finally, depression scores amongst caregivers also varied widely, with caregivers of children with internalizing behaviour problems reporting higher depression scores ($M = 6.84$, $p < .05$) than every other group. Caregivers of healthy children reported significantly lower depression scores ($M = 3.49$, $p < .05$) than the other groups.

Table 7 - Overall Descriptives

Age 10-11

Characteristics	Overall	CC + BP	CC	BBP	EBP	IBP	Healthy	dF	F / X²	n² / V
Sample Size (%)	**4632 (100)**	**94 (2.03)**	**260 (5.61)**	**84 (1.82)**	**517 (11.17)**	**116 (2.51)**	**3561 (76.87)**			
Child characteristics										
Age (M)	10.49	10.49	10.56	10.54	10.48	10.55	10.49	5	1.63	0.002
Female	50.54	32.94^{ef}*E*	42.54$^{c}_{ef}$	25.15^{bdef}*E*	40.00^{cef}	54.30^{abcd}	53.60^{abcd}	5	77.05*	0.129
General Health (Excellent or Very Good)	89.66	73.90^{cdef}*E*	68.46$^{c}_{def}$	*f*^{b}	90.87^{ab}	85.23^{abf} *E*	91.58^{abe}	5	168.60 *	0.191
Caregiver characteristics										
Age (M)	40.06	39.33^{e}	40.30	40.51	39.19^{e}	41.35^{ad}	40.13	5	4.30*	0.005
Female	91.57	*f*^{c}	94.64^{c} *E*	87.86^{ab}*E*	91.90	*f*	91.21	5	8.69	0.043
Income (M, $)	75 583	63 043^{f}	76 533	68 460	67 447	69 448	77 396^{a}	5	4.42*	0.047
Education (High school or above)	89.25	86.64*E*	86.96 *E*	83.06^{f}*E*	85.20^{f}	89.12*E*	90.22^{cd}	5	17.68*	0.062
Married or common-law	83.20	82.80^{e}*E*	79.02$^{e}_{f}$	79.04*E*	81.32^{e}	69.17^{abdf} *E*	84.35^{be}	5	25.29*	0.074
General Health (Excellent or Very Good)	69.43	48.31^{cdf}	51.95$^{d}_{f}$	64.04^{a}*E*	67.74^{ab}	61.40^{f}	71.87^{abe}	5	71.56*	0.125
Depression (M)	3.84	4.77^{ef}	5.07^{ef}	3.97^{e}*E*	4.74^{ef}	6.84^{abcdf}	3.49^{abde}	5	19.15*	0.021

* For Cramer's V, effect sizes of <.1 were considered small, <.3 were considered medium, and <.5 were considered large[89]. For eta-squared, effect sizes of <.01 were considered small, <.06 were considered medium, and <.14 were considered large[90]. Superscripts indicate significant differences with the value of the associated column. The "Overall" column was not used for differences testing. *E* indicates to interpret with caution due to variation. *f* indicates censoring due to high variation. CC = Chronic Condition, BP = Behaviour Problem, BBP = Both Behaviour Problems, EBP = Externalizing Behaviour Problems, IBP = Internalizing Behaviour Problems.

Depression Scores - Overall:

We first explore the impact of child group on caregiver depression through multiple regression models.

Table 8 describes caregiver depression (as measured by the CES-D[86]) by child health condition for children aged 10 – 15 years old. Gender, income, education, and marital status represents effect sizes when the person is female, has low income, obtains a degree lower than a high school diploma (if any), and is single or divorced. Three models are presented in order to assess the impact of the different covariates.

Table 8: Multiple Regression Models of Depression for Caregivers of Children Aged 10 – 15 Years Old.

Variable	Model 1		Model 2		Model 3	
	SBC	Sig.	SBC	Sig.	SBC	Sig.
CC + BP	.049*	.001	.051*	<.001	.043*	.003
CC	.076*	<.001	.078*	<.001	.071*	<.001
BBP	.026	.094	.025	.101	.020	.170
EBP	.098*	<.001	.100*	<.001	.088*	<.001
IBP	.066*	<.001	.064*	<.001	.051*	<.001
Child Age	-	-	.008	.588	.014	.349
Child Gender	-	-	.036*	.018	.031*	.034
CG Age	-	-	-	-	-.055*	<.001
CG Gender	-	-	-	-	.033*	.024
Income	-	-	-	-	.171*	<.001
Education	-	-	-	-	.058*	<.001
Marital Status	-	-	-	-	.187*	<.001
Model R^2	1.83%		1.92%		11.75%	

Legend: CC = Chronic Conditions, BP = Behaviour Problems, BBP = Both Behaviour Problems, EBP = Externalizing Behaviour Problems, IBP = Internalizing Behaviour Problems, CG= Caregiver, SBC = Standardized Beta Coefficient. *$p < .05$.

Child health condition was consistently and significantly associated with caregiver depression for all three models. Externalizing behaviour problems had the biggest impact on caregiver depression ($\beta = 0.098, 0.100, 0.088$, for models 1, 2, and 3, respectively). For all

the child health conditions, only children presenting both behaviour problems did not have a significant impact on caregiver depression. The addition of socioeconomic predictors to the model were each significantly associated with caregiver depression, and also had the highest effect size of all variables within the model ($\beta_{income} = 0.171$ and $\beta_{marital\ status} = 0.187$). Nevertheless, child health conditions were significantly associated with caregiver depression, even after accounting for socioeconomic and demographic factors.

Depression Scores – Per Age Group:

We further investigated the observed health associations by examining potential longitudinal components through age subgroup analyses (10 – 11, 12 – 13, 14 – 15).

Table 9 describes each age groups' (10 – 11, 12 – 13, and 14 – 15) final multiple regression model. Very few differences were noted on significance and effect size between the final model and the previous two models. Therefore, we only present the final model. The model incorporates demographic variables (child and caregiver age and gender) as well as socioeconomic variables (income, education, and marital status).

Table 9: Caregiver Depression Association with Child Health Condition and All Hypothesized Covariates

Variable	Ages 10 - 11		Ages 12 - 13		Ages 14 - 15	
	SBC	Sig.	SBC	Sig.	SBC	Sig.
CC + BP	.032*	.024	.081*	<.001	.049*	.002
CC	.067*	<.001	.080*	<.001	.031*	.048
BBP	.009	.509	.037*	.012	.063*	<.001
EBP	.063*	<.001	.048*	.001	.059*	<.001
IBP	.077*	<.001	.018	.215	.019	.252
Child Age	-.021	.145	.002	.904	-.032*	.040
Child Gender	.025	.081	.046*	.002	.013	.394
CG Age	-.039*	.007	-.046*	.002	-.050*	.001
CG Gender	.061*	<.001	.020	.190	.030	.057
Income	.135*	<.001	.150*	<.001	.175*	<.001
Education	.078*	<.001	.108*	<.001	.017	.281
Marital Status	.188*	<.001	.196*	<.001	.155*	<.001
Model R^2	10.67%		12.04%		8.98%	

Legend: CC = Chronic Conditions, BP = Behaviour Problems, BBP = Both Behaviour Problems, EBP = Externalizing Behaviour Problems, IBP = Internalizing Behaviour Problems, CG= Caregiver, SBC = Standardized Beta Coefficient. *$p < .05$.

Most child health condition variables were significantly associated with caregiver depression across the three age groups. The following longitudinal patterns were noted: 1) the effect size of income, caregiver age, and caring for children with both behaviour problems increased over time (βrange = .135 to .175, = -.039 to -.050, and = .009 to 0.63, respectively), 2) the size of the observed associations of internalizing behaviour problems and caregiver gender were significant at ages 10 – 11 (β = .077 and = .061, respectively), but diminished and became non-significant between ages 12 – 15 (βrange = .018 to .019 and = .020 to .030, respectively), 3) the size of the observed associations of children with both a chronic condition and a behaviour problem and just a chronic condition increased at ages 12 – 13 (β_{CC+BP} = .032 to .081, and β_{CC} = .067 to .080) and then decreased at ages 14 – 15 (β_{CC+BP} = .081 to .049, and β_{CC} =.080 to .031). As with the cross-sectional model, income and marital status were the most significant predictors over all three models. Nevertheless,

child health condition variables largely remained significant predictors of caregiver depression.

Results from both sets of cross-sectional and longitudinal data analyses suggest an important and significant association between child behaviour problems and caregiver depression status. The association remained even after controlling for the impact of socioeconomic and demographic variables on caregiver depression. The association between externalizing behaviour problems and caregiver psychological health was strong and consistent for both cross-sectional and longitudinal models, but still showed a decrease and then an increase longitudinally. The association between internalizing behaviour problems and caregiver psychological health was significant and consistent for the cross-sectional model, but showed a decrease over time for the longitudinal models.

Self-Reported Health – Overall:

We now explore the association between child group and caregiver self-reported health through logistic regression models. We model the odds of a caregiver reporting good/fair/poor health compared to excellent/very good.

Table 10 describes the logistic regressions that explore the association between child health condition and caregiver self-reported health for children aged 10 – 15 years old combined. Gender, income, education, and marital status represents effect sizes when the person is female, has low income, detains a degree lower than a high school diploma (if any), and is single or divorced.

Table 10: Logistic Regression Models of Self-Reported Health for Caregivers of Children Aged 10 – 15 Years Old.

Variable	Model 1		Model 2		Model 3	
	Odds Ratio	Confidence Interval	Odds Ratio	Confidence Interval	Odds Ratio	Confidence Interval
CC + BP	2.73*	1.76 – 4.23	2.76*	1.78 – 4.28	2.73*	1.75 – 4.25
CC	1.92*	1.42 – 2.58	2.00*	1.48 – 2.70	1.93*	1.43 – 2.62
BBP	1.66	0.99 – 2.77	1.70*	1.02 – 2.85	1.65	0.98 – 2.79
EBP	1.29*	1.04 – 1.59	1.30*	1.05 – 1.61	1.30*	1.04 – 1.61
IBP	1.13	0.76 – 1.70	1.04	0.69 – 1.56	0.99	0.65 – 1.50
Child age	-	-	1.11*	1.07 – 1.16	1.09*	1.04 – 1.13
Child gender	-	-	1.09	0.95 – 1.25	1.06	0.92 – 1.22
CG age	-	-	-	-	1.02*	1.00 – 1.03
CG gender	-	-	-	-	1.14	0.90 – 1.45
Income	-	-	-	-	2.03*	1.63 – 2.53
Education	-	-	-	-	1.46*	1.20 – 1.78
Marital status	-	-	-	-	1.20	0.99 – 1.44
Model R^2	1.04%		1.76%		3.85%	

Legend: CC = Chronic Conditions, BP = Behaviour Problems, BBP = Both Behaviour Problems, EBP = Externalizing Behaviour Problems, IBP = Internalizing Behaviour Problems. *$p < .05$.

Child health condition variables showed a significant and consistent association with caregiver self-reported health. Only child internalizing behaviour problems fail to demonstrate a significant association with caregiver health across all three models. Children with both a chronic condition and a behaviour problem showed the strongest association with caregiver self-reported health across all three models with caregivers being more than twice as likely to report poor health (OR_{range} = 2.73 - 2.76). Overall, caregivers were more likely to report poorer health if they had a child with a health condition or behavior problem with the exception of internalizing behaviour problems. The odds of reporting poorer caregiver health was also associated with older child age, older parent age, lower income and less than a high school level of education. The socioeconomic predictors were associated with an increased

likelihood in poor caregiver self-reported health (OR_{income} = 2.03 and $OR_{education}$ = 1.46), with the exception of marital status which was in the right direction but was not significant ($OR_{marital\ status}$ = 1.20). Nevertheless, child health condition variables remained significantly associated with caregiver self-reported health, even after accounting for socioeconomic and demographic variables.

Self-Reported Health – Per Age Group:

We further investigated the observed health associations by examining longitudinal associations through age subgroup analyses (10 – 11, 12 – 13, 14 – 15).

Table 11 describes each age groups' (10 – 11, 12 – 13, and 14 – 15) final logistic regression model. Very few differences were noted on significance and effect size between the final model and the previous two models. Therefore, we only present the final model. The model incorporates demographic variables (child and caregiver age and gender) as well as socioeconomic variables (income, education, and marital status).

Table 11: Caregiver Self-Reported Health Association with Child Health Condition and All Covariates

Variable	Ages 10 - 11		Ages 12 - 13		Ages 14 - 15	
	Odds Ratio	Confidence Interval	Odds Ratio	Confidence Interval	Odds Ratio	Confidence Interval
CC + BP	2.67*	1.75 – 4.06	4.08*	2.48 – 6.73	2.20*	1.39 – 3.48
CC	2.32*	1.78 – 3.01	1.32	0.98 – 1.76	1.64*	1.19 – 2.26
BBP	1.36	0.86 – 2.15	0.73	0.40 – 1.32	2.26*	1.36 – 3.77
EBP	1.20	0.98 – 1.47	1.27*	1.01 – 1.61	1.25	0.99 – 1.57
IBP	1.69*	1.13 – 2.53	1.12	0.64 – 1.96	0.95	0.64 – 1.42
Child age	1.12	0.99 - 1.28	1.04	0.90 – 1.20	1.23*	1.06 – 1.41
Child gender	1.01	0.88 – 1.15	0.94	0.82 – 1.09	0.98	0.85 – 1.13
CG age	1.02*	1.01 – 1.03	1.00	0.99 – 1.02	1.01	1.00 – 1.03
CG gender	0.96	0.76 – 1.21	0.99	0.77 – 1.28	1.01	0.80 – 1.27
Income	1.45*	1.20 – 1.76	1.95*	1.55 – 2.44	2.56*	2.01 – 3.27
Education	1.62*	1.32 – 1.98	2.29*	1.84 – 2.87	1.34*	1.06 – 1.71
Marital status	1.42*	1.19 – 1.69	1.31*	1.08 – 1.59	1.06	0.87 – 1.27
Model R^2	3.40%		4.57%		3.39%	

Legend: CC = Chronic Conditions, BP = Behaviour Problems, BBP = Both Behaviour Problems, EBP = Externalizing Behaviour Problems, IBP = Internalizing Behaviour Problems. *$p < .05$.

Most child health condition variables were significantly associated with caregiver self-reported health across all three age groups. Of all child health conditions, children with both a chronic condition and a behaviour problem had the highest impact on caregiver self-reported health over all ages with caregivers being two to four times as likely to report poor health (OR_{range} = 2.20 to 4.08). Interestingly, caregivers of children with internalizing behaviour problems were more likely to report poor health only when the child was aged 10-11 years old (OR_{IBP} = 1.69). Caregivers of children with externalizing behaviour problems were more likely to report poor health only when the child was aged 12-13 years old (OR_{EBP} = 1.27). The following longitudinal patterns were noted: 1) the effect size of income

increased over time (OR_{range} = 1.45 to 2.56), 2) the strength of the caregiver health association of internalizing behaviour problems and marital status decreased over time (OR_{range} = 1.69 to 0.95 and = 1.42 to 1.06, respectively), 3) the strength of the caregiver health association of caring for a child with both a chronic condition and a behaviour problem, caring for a child with externalizing behaviour problems, and education increased at ages 12 – 13 (OR_{CC+BP} = 2.67 to 4.08, OR_{EBP} = 1.20 to 1.27, $OR_{education}$ = 1.62 to 2.29) but then decreased at ages 14 – 15 (OR_{CC+BP} = 4.08 to 2.20, OR_{EBP} = 1.27 to 1.25, $OR_{education}$ = 2.29 to 1.34), and 4) the strength of the caregiver health association of caring for a child with a chronic condition and caring for a child with both behaviour problems decreased at ages 12 – 13 (OR_{CC} = 2.32 to 1.32, OR_{BBP} = 1.36 to 0.73), but increased at ages 14 – 15 (OR_{CC} = 1.32 to 1.64, OR_{BBP} = 0.73 to 2.26) . Socioeconomic variables were also significantly associated with caregiver health. Nevertheless, child health condition variables remained significantly associated with caregiver self-reported health, even when accounting for demographic and socioeconomic variables.

Results from both sets of cross-sectional and longitudinal data analyses suggest important and significant associations of child behaviour problems on caregiver self-reported health. Child health conditions remained important for caregiver self-reported health even when accounting for socioeconomic variables. The association of externalizing behaviour problems on caregiver physical health was strong and consistent for the cross-sectional models. Results from the longitudinal models suggest externalizing behaviour problems likely have an important association with caregiver physical health, as effect sizes were similar throughout and just shy of significant at ages 10 – 11 and 14 – 15. The association

with internalizing behaviour problems was significant for the longitudinal model at ages 10 - 11, but showed a decrease over time.

Overall Impact on Caregiver Depression and Self-Reported Health:

Overall, the presence of a child externalizing or internalizing behaviour problem is associated with both caregiver physical and psychological health, more so when the behaviour problem is accompanied by a chronic condition. However, the association between internalizing behaviour problems and caregiver self-reported physical health remains tenuous, and merits further exploration. Currently, there are no indications that the associations between both internalizing and externalizing child behaviour problems and caregiver health are cumulative. That is, the observed association of caring for a child with both behaviour problems does not appear to be equivalent to the observed association of caring for a child with internalizing behaviour problems and adding the association of caring for a child with externalizing behaviour problems.

Having both a chronic condition and a behaviour problem was consistently one of the strongest associated variable with caregiver health according to self-reported depression or self-reported health. This suggests behaviour problems exacerbate the effect of caring for a child with chronic health conditions.

Most models were consistent in suggesting significant associations between child behavior problems and caregiver psychological and physical health. However, increases by child age group were not consistently demonstrated. The strength of association of caring for a child with both a chronic condition and a behaviour problem appears to increase at ages 12

– 13 and then decrease at ages 14 – 15 for both caregiver physical and psychological health. Finally, there appeared to be a decreasing strength of association of child internalizing behaviour problems over time, both on caregiver depression and self-reported health.

The association between child behaviour problems and caregiver physical and psychological health remained significant even after controlling for socioeconomic and demographic factors. This suggests that the associations between child health condition and caregiver health goes beyond socioeconomic explanations. The presence of child behaviour problems are likely an important factor of caregiver health, above and beyond other socioeconomic and demographic factors.

Systematic Review and Meta-Analysis

Available Literature Identified from Study Selection:

Figure 2 describes the study selection process. A total of 32,311 citations were identified by the electronic search and collated. Following removal of duplicates, 26,466 citations remained for review. After the initial Stage 1 title screen, 22,374 citations were excluded due to irrelevancy and 4,092 remained for Stage 2 abstract screening. During Stage 2 abstract screening, there was a 92.93% agreement between MC and reviewers KC and EH. The abstract screen resulted in 196 articles selected for Stage 3 full text screening. A subsequent duplicate removal further reduced the number of included articles to 174. The reasons for exclusion as per our inclusion criteria in Chapter 2 were as follows: **1)**The study involved human participants (0 studies), **2)** The article provided empirical data from a research study described in a complete journal article (i.e. commentaries, letters, reviews, published

abstracts, were excluded) and did not focus on retrospective reports of the subject's childhood (9 studies), **3)** The study was written in either French or English (2 studies), **4)** The caregiver(s) in the study was (were) the parent(s) or informal cargiver(s) of the child (1 study), **5)** The "cared for" (i.e. children) were between 2 and 18 years of age (1 study), **6)** The study had an a priori group definition of "Parents of children with a health condition", meaning that the investigators specified which groupings they were studying before assessing differences. Examples of something we don't want are prospective cohorts, where parents are measured on an outcome throughout the study period, at the end of which they verify which children had behaviour problems (4 studies), **7)** The child's behaviour problem is clearly defined as either Internalizing or Externalizing, or it falls in a diagnostic category associated with internalizing or externalizing behaviour problems, as per our definition in Chapter 2 (23 studies), **8)** The hypothesis leading to the study groups was about child behaviours and not caregiver outcomes or characteristics (21 studies), **9)** The study assessed a caregiver physical or psychological health outcome of interest to the review (e.g. self-reported health, GHQ scores, depression scores, anxiety) (8 studies), **10)** The caregiver outcomes were assessed quantitatively, in a way that allowed for an effect size estimation of the differences in impact on caregiver health (e.g. odds ratios, t-tests, analyses of variance, chi-square tests) (3 studies), **11)** The study matched our framework and purpose in terms of studying the effects of child behaviour problem status on parent health. Examples of designs that would not match our framework include those where the groupings are not applicable (e.g. Gene presence vs. Gene absence), or those where the caregiver outcome was present before the child behaviour problem was measured (e.g. prenatal and perinatal depression). (48 studies), and **12)** There was a proper control group that allowed for contrast between Internalizing vs. Externalizing, Internalizing vs. healthy, or Externalizing vs. healthy.

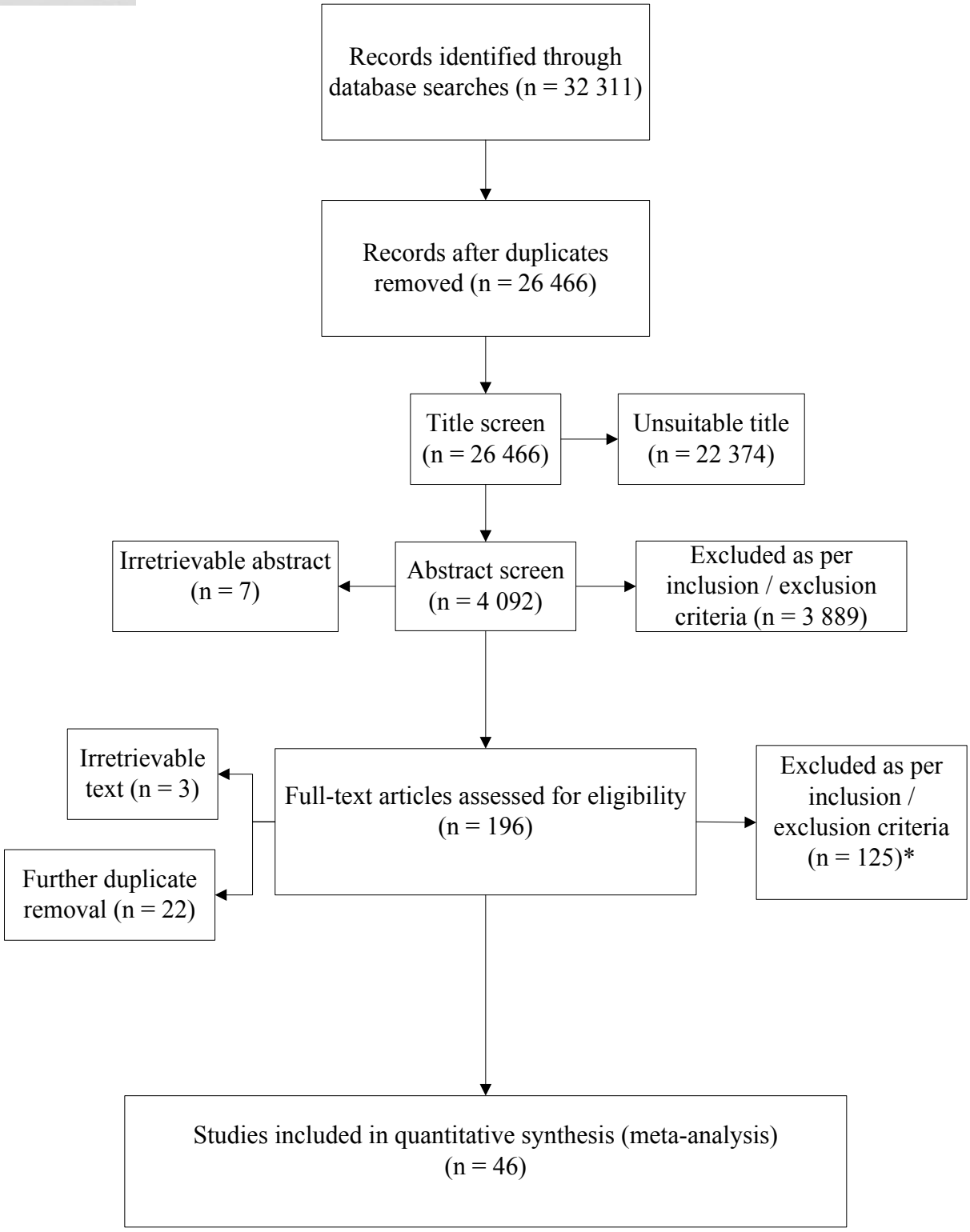
Healthy was considered to be children without internalizing or externalizing behaviour problems. An example of a study not meeting eligibility criteria would be one which compared children with ADHD to children with a more severe form of ADHD without any other control group, as this study would only be providing information on an Externalizing vs. Externalizing comparison (5 studies). Three studies were further excluded for irretrievable text. All exclusions were marked based on the first one encountered. That is, each study only had one exclusions reason attached to it. The full text screening led to a final set of 46 included articles which were retained for the meta-analysis. Agreement at the full text screening was 79.31%. Some articles were not obtainable through either the hospital or university libraries nor through inter-library loans; these are reflected as such in the flow diagram describing study selection.

Study Characteristics:

Table 12 presents a summary of study characteristics as well as child characteristics for the included studies. Appendix E presents evidence tables that provide a detailed summary of the included study characteristics. All studies were published between 1985 and 2012 (median year 2000). Fifteen (32.6%) of the included studies were not published in peer-reviewed literature, and instead were obtained through a thesis (Master's and Ph.D) repository. Only 6 studies (14. 9%) used an externalizing or internalizing classification to determine their child health groupings, with the majority of children being classified as having Attention Deficit Disorder (ADD) or Attention Deficit Hyperactivity Disorder (ADHD) (30 studies, 65.2%). Six studies (13.0%) reported sample sizes of at least 100 caregivers per group. There were a total of 4,067 children with a health condition of interest across all studies (median = 49) and a total of 19,950 healthy children across all studies

(median = 35). Comparisons in 38 of the included studies (82.6%) were made between parents of children with externalizing behaviour problems and a control group of parents of healthy children, 6 studies (13.0%) reported on differences between parents of children with internalizing behaviour problems and a control group of parents of healthy children, and 3 studies (6.5%) reported differences between parents of children with internalizing behaviour problems and parents of children with externalizing behaviour problems. It was possible for one study to explore more than one comparison. Control groups were defined as caregivers of children with no identified health condition. For example, a study could have compared children with ADHD to children without ADHD. The children without ADHD were considered our control group of "healthy" children even if they were not assessed as being without any other health limiting condition. Child age ranged from 3.92 years old to 15.4 years old. Child gender, when reported, was mostly male for children (26 studies had 75%+ male children in the exposure group) with reported behaviour problems.

Figure 2: PRISMA Flow Diagram – Study Selection Process



*Reasons for full text exclusion are enumerated in detail in the main text.

Table 13 presents a summary of characteristics of the caregivers assessed within the included studies. Overall 23 studies (50.0%) looked at the health outcomes of mothers only, while 2 studies (4.3%) looked only at fathers' outcomes. A total of 11 studies (23.9%) reported outcomes on both mothers and fathers separately, and a total of 9 studies (19.6%) reported outcomes on parents (gender was unclear). Caregivers were typically under 40 years of age (totals of 52.2% and 50.0% of studies reported average caregiver age to be under 40 years old for the exposure and control groups, respectively). Also, the majority of caregivers assessed in both the exposure groups and control groups were female (54.3% and 52.2% of studies reported 75% or more of their caregivers as female for study and control groups, respectively). Furthermore, most caregivers in the exposure groups and the control groups had completed high school (54.3% of studies reported caregivers as having finished high school for both the study and control groups). Regarding ethnicity, in both the study and the control groups, most caregivers were Caucasian (50.0% of studies reported caregivers as being in majority Caucasian for both the study and control groups). Caregiver age, education, and ethnicity were not reported by totals of 13 (28.3%), 17 (37.0%), and 17 (37.0%) studies, respectively. Finally, a total of 10 different caregiver health outcomes were extracted from the included studies, only one of which measured physical health. As only one study reported results on physical health, it is not reported here.

Table 12: Study and Child Characteristics

Characteristic	# of studies (%)	# studies with missing information(%)
#Total Included Studies	46	
Peer-Reviewed		
Yes	31 (67.4)	0 (0)
No	15 (32.6)	
Classification		
Clinical Diagnosis	40 (87.0)	0 (0)
Externalizing or Internalizing	6 (14.9)	
Sample Size - Study group		
Smaller than 100	40 (87.2)	0 (0)
Over 100	6 (13.0)	
Sample Size - Control group		
Smaller than 100	36 (78.2)	0 (0)
Over 100	10 (21.7)	
Child Age* - Study group		
<=9	21 (45.7)	0 (0)
>9	25 (54.3)	
Child Age* - Control group		
<=9	23 (50.0)	3 (6.5)
>9	20 (43.5)	
Child Gender - Study group**		
Male	26 (56.5)	4 (8.7)
Female	0	
Both	16 (34.8)	
Child Gender - Control group**		
Male	18 (39.1)	8 (17.4)
Female	1 (2.2)	
Both	19 (41.3)	
Year of Publication		
<= 2000	23 (50.0)	0 (0)
> 2000	23 (50.0)	

For descriptive purposes:

* Studies were marked as above or under the age mark based on average age of the sample

** Studies with a 75%+ gender composition were considered either male or female. Anything else was categorized as representing both child genders equally.

Table 13: Caregiver Characteristics Within Included Studies

Characteristic	# of studies (%)	# studies with missing information(%)
#Total Included Studies	46	
CG Age* - Study group		
<40	24 (52.2)	13 (28.3)
>=40	9 (19.6)	
CG Age* - Control group		
<40	23 (50.0)	14 (30.4)
>=40	9 (19.6)	
Caregiver Gender - Study group**		
Male	2 (4.3)	4 (8.7)
Female	25 (54.3)	
Both	15 (32.6)	
Caregiver Gender - Control group**		
Male	2 (4.3)	4 (8.7)
Female	24 (52.2)	
Both	16 (34.8)	
CG Education* - Study**		
Less than high school	4 (8.7)	17 (37.0)
High school or above	25 (54.3)	
CG Education* - Control**		
Less than high school	3 (6.5)	18 (39.1)
High school or above	25 (54.3)	
CG Ethnicity** - Study**		
Majority Caucasian	23 (50.0)	17 (37.0)
Majority non-Caucasian	6 (13.0)	
CG Ethnicity** - Control**		
Majority Caucasian	23 (50.0)	17 (37.0)
Majority non-Caucasian	6 (13.0)	

For descriptive purposes:

* Studies were marked as above or under the age mark based on average age of the sample

** Studies with a 75%+ gender composition were considered either male or female. Anything else was categorized as representing both child genders equally.

*** 50%+ of the caregiver sample had to have completed high school to be classified as such

**** 50%+ of the caregiver sample had to be Caucasian to be marked as such

Caregiver Health Outcomes Reported:

Table 14 describes the CG health outcomes reported. The four most reported outcomes were depression, psychiatric symptoms, stress, and anxiety. These outcomes were also the only ones with available data for all three comparisons of interest (Externalizing vs. Healthy, Internalizing vs. Healthy, and Externalizing vs. Internalizing). A total of 14 scales were used to measure these outcomes. Other less common outcomes included burden, well-being, and quality of life (QOL). A total of 9 different scales were used to measure these 5 remaining outcomes.

Risk of Bias within Included Studies:

Studies were assessed for their risk of bias using a modified approach as described in Chapter 2. Four common limitations were noted across included studies: (i) failure to conduct statistical adjustment for confounding (37/46=80.4%); (ii) failure to perform and/or describe matching (35/46=76.1%); (iii) failure to report p-values (35/46=76.1%); and (iv) failure to report a description of the caregivers (22/46 = 47.8%). It is important to note that 8 of the included studies (17.4%) did not describe children adequately, meaning that child age and sex were not described. There is a potential of bias of the estimates of between-group differences on caregiver health due to a difference in the unknown demographics of the children being cared for. Nevertheless, children were more often described than their caregivers. Studies with the lowest risk of bias and with the highest risk of bias both compared caregivers of children with externalizing behaviour problems with caregivers of healthy children.

TABLE 14 – SCALES USED PER OUTCOME*

Outcome	# Studies	Scales Used (# times used)
Externalizing vs. Healthy		
Depression	15	BDI(7), CES-D(6), MMPI(1), DIS-3-R(1)
Stress	12	PSI(3), PSI-Form6(3), PSI-SF(4), CSS(1), NCSQ(1)
Psychiatric Symptoms	10	SCL-90-R(5), CHq(1), GHQ-28(2), BSI(2)
Anxiety	5	SCL-90-R(2), BAI(2), DIS-3-R(1)
Well-Being	4	SOPWB(2), SOSWB(1), Self-made scales(2)
QOL	2	WHOQOL-BREF(1), QLI (1)
Daily Hassles	1	PDH(1)
Burden	1	CSI(1)
Distress	1	PSS(1)
Internalizing vs. Healthy		
Depression	4	BDI(3), CES-D(1)
Psychiatric Symptoms	2	GHQ-28(1), BSI(1)
Stress	2	PSI-SF(1), PSI(1)
Anxiety	2	SCL-90-R(1), BAI(1)
Externalizing vs. Internalizing		
Stress	2	PSI(2)
Anxiety	2	SCL-90-R(1), BAI(1)
Depression	1	CES-D(1)
Psychiatric Symptoms	1	GHQ-28(1)

*The scales used are the: Beck Depression Inventory (BDI)[103], Center for Epidemiological Studies – Depression scale (CES-D)[86], Minnesota Multiphasic Personality Inventory (MMPI)[104], Diagnostic Interview Schedule for DSM-3 R (DIS-3-R)[105], Parenting Stress Index (PSI)[106], Parenting Stress Index Form 6 (PSI-Form6)[107], Parenting Stress Index – Short Form (PSI-SF)[108], Caregiver Stress Scale (CSS)[109], The Nijmegen Child-Rearing Situation Questionnaire (NCSQ)[110], Symptom Check List-90-Revised (SCL-90-R)[111], Chinese Health Questionnaire (CHq)[112], General Health Questionnaire – 28 item (GHQ-28)[113], Brief Symptom Inventory (BSI)[114], Beck Anxiety Inventory (BAI)[115], Scales Of Psychological Well-Being (SOPWB)[116], Scales Of Spiritual Well-Being (SOSWB)[117], Self-Made Scales[118, 119], World Health Organisation Quality Of Life – BREF (WHOQOL-BREF)[120], Quality Life Index (QLI)[77], Parenting Daily Hassles (PDH)[121], Caregiver Strain Index (CSI)[122], Perceived Stress Scale (PSS)[123].

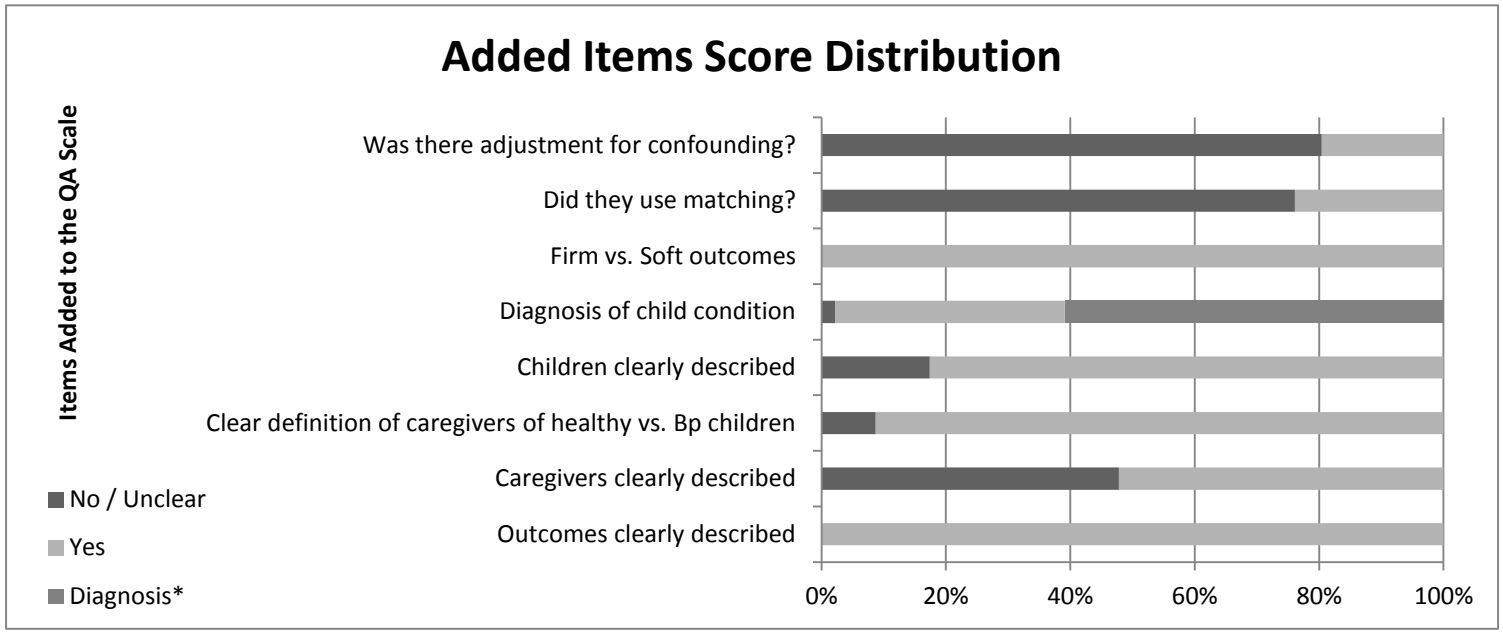
Figure 3 presents the distribution of assessments for the additional items we reviewed beyond those that were drawn from the Downs and Black Scale[94]. Some of these items did not provide discriminatory power (e.g. “Outcomes clearly described” and “Hard vs. Soft

outcomes"). All studies clearly described their outcomes and all studies measured their outcomes using "soft" methods. That is, the outcomes consisted of scores computed using questionnaires and were not based on medical diagnoses. Four items provided little variation, and were either adequate amongst included studies ("Children clearly described" and "Clear definition of caregivers of healthy vs. BP children") or mostly failed ("Was there adjustment for confounding?" and "Did they use matching?"). Two items provided high levels of variation ("Diagnosis of child condition" and "Caregivers clearly described"); that is, many studies were rated differently for those two items. Scores for all items are presented in appendix F.

Summary of Individual Study Findings:

A narrative summary of study-specific findings is presented, with a focus on the identification of statistically significant associations between child behavior problems and caregiver health measures. Study-level data are presented and meta-analyzed later in this chapter. Appendix E describes findings for each individual study included in our study-selection process. Appendix G presents the range of outcomes reported on by each included study.

Figure 3: Added Items Score Distribution



*Child behaviour problem (BP) was determined by medical diagnosis rather than self-report or parent-reported scale

Caregivers of Children with Externalizing Behaviour Problems vs. Caregivers of Healthy Children

The included studies reported data on nine outcomes. Most of the studies[21, 48, 49, 50, 51, 52, 77, 78, 118, 119, 124-154] (n=41/46, 89.1%) compared caregivers of children with externalizing behaviour problems vs. caregivers of healthy children. A summary of the specific measurement scales used per outcome was provided in Table 14.

Below, we present further information on our three main outcomes of interest (depression, psychiatric symptoms, and stress), after which study results of all other outcomes are briefly summarized. One study[143] is not considered below since it was the only study that solely provided frequency per group data instead of means per group, and therefore could not be incorporated within the meta-analysis of studies assessing depression or anxiety in caregivers.

Of the 14 studies that compared caregivers of children with externalizing behaviour problems and caregivers of healthy children on depression[21, 52, 127 – 134, 137, 138, 148, 150], 11 (78.6%)[21, 52, 127 – 129, 131, 132, 134, 137, 138, 148] reported statistically significant results suggesting caregivers of children with externalizing behaviour problems suffer from more depression than caregivers of healthy children. Within the 14 studies, 12 (85.7%)[52, 127 – 134, 137, 138, 150] investigated the association between mothers and child health condition, 3 (21.4%)[131, 132, 137] investigated the association between fathers and child health condition, and 2 (14.3%)[21, 148] investigated the association between "parents" (unspecified gender) and child health condition. Within each of these subgroups, statistically significant associations were found in totals of 9 (75%)[52, 127 – 129, 131, 132, 134, 137, 138], 2 (66.7%)[131, 132], and 2(100%)[21, 148] studies, respectively.

Of the 10 studies that compared caregivers of children with externalizing behaviour problems and caregivers of healthy children in terms of caregiver psychiatric symptoms[50, 51, 78, 136, 139, 142, 145, 146, 151, 152], 6 (60%)[50, 51, 139, 142, 145, 146] reported statistically significant results, suggesting caregivers of children with externalizing behaviour problems suffer from more psychiatric symptoms than caregivers of healthy children. Within the 10 studies, 8 (80%)

symptoms[50, 51, 78, 136, 145, 146, 151, 152] investigated the association between mothers and child health condition, 3 (30%)[51, 139, 146] investigated the association between fathers and child health condition, and 1 (10%)[142] investigated the association between "parents" (unspecified gender) and child health condition. Within each of these subgroups, statistically significant associations were found in totals of 4 (50%)[50, 51, 145, 146], 1 (33%)[139], and 1(100%)[142] studies, respectively.

Of the 12 studies that compared caregivers of children with externalizing behaviour problems and caregivers of healthy children in terms of parenting stress[48, 49, 77, 124, 126, 130, 144, 147, 149, 151, 153, 154], 10 (83.3%)[48, 49, 124, 126, 130, 144, 149, 151, 153, 154] reported statistically significant results, suggesting caregivers of children with externalizing behaviour problems suffer from more parenting stress than caregivers of healthy children. Within the 12 studies, 8 (66.7%)[48, 124, 126, 130, 144, 149, 151, 153] investigated the association between mothers and child health condition, 2 (16.7%)[77, 144] investigated the association between fathers and child health condition, and 3 (25%)[49, 147, 154] investigated the association between "parents" (unspecified gender) and child health condition. Within each of these subgroups, statistically significant associations were found for totals of 7 (87.5%)[48, 124, 126, 130, 149, 151, 153], 1 (50%)[144], and 2 (66.7%)[49, 154] studies, respectively.

For all remaining outcomes, the following associations were noted (number of studies reporting statistically significant associations noted in brackets). Caregivers of children with externalizing behaviour problems suffer from more burden than caregivers of healthy children (1/1, 100%)[141]. Few studies significantly supported that caregivers of children with externalizing behaviour problems suffer from more anxiety than caregivers of healthy

children (1[127]/4[127, 135, 148, 150], 25%). All of these studies' summary measures pointed to the fact that caregivers of children with externalizing behaviour problems had higher anxiety, but only one did so with statistical significance. This may be related to small sample sizes where studies were underpowered to detect differences. There was some evidence supporting the notion that caregivers of healthy children have higher well-being than caregivers of children with externalizing behaviour problems (2[118, 125]/4[118, 119, 125, 148], 50%). Caregivers of children with externalizing behaviour problems suffer from more distress than caregivers of healthy children (1/1, 100%)[144]. Caregivers of children with externalizing behaviour problems may have a lower quality of life than caregivers of healthy children (1[140]/2[77, 140], 50%). Finally, caregivers of children with externalizing behaviour problems demonstrate higher levels of daily hassles than caregivers of healthy children (1/1, 100%)[128].

Caregivers of Children with Internalizing Behaviour Problems vs. Caregivers of Healthy Children

The included studies reported data on five outcomes. Few studies (n=7/46, 15.2%) compared caregivers of children with internalizing behaviour problems vs. caregivers of healthy children[135, 150, 151, 155-158]. A summary of the specific measurement scales used per outcome was provided earlier (Table 14).

Below, we present further information on our three main outcomes of interest (depression, psychiatric symptoms, and stress), after which study results of all other outcomes are briefly summarized.

Of the 4 studies that compared caregivers of children with internalizing behaviour problems and caregivers of healthy children on depression[150, 156-158], 3 (75%)[150, 156, 158] reported statistically significant results suggesting caregivers of children with internalizing behaviour problems suffer from more depression than caregivers of healthy children. Within the 4 studies, 4 (100%)[150, 156-158] investigated the association between mothers and child health condition, 3 (75%)[156-158] investigated the association between fathers and child health condition, and none investigated the association between "parents" (unspecified gender) and child health condition. Within each of these subgroups, statistically significant associations were found for totals of 3 (75%)[150, 156, 158] and 0 (0%) studies, respectively.

Of the 2 studies that compared caregivers of children with internalizing behaviour problems and caregivers of healthy children on psychiatric symptoms[151, 155], 1 (50%)[155] reported statistically significant results suggesting caregivers of children with internalizing behaviour problems suffer from more psychiatric symptoms than caregivers of healthy children. Within the 2 studies, 1 (50%)[151] investigated the association between mothers and child health condition, 1 (50%)[155] investigated the association between fathers and child health condition, and none investigated the association between "parents" (unspecified gender) and child health condition. Within each of these subgroups, statistically significant associations were found for totals of 0 (0%) and 1 (100%)[155] studies, respectively.

Of the 2 studies that compared caregivers of children with internalizing behaviour problems and caregivers of healthy children on parenting stress[151, 157], 1 (50%)[151] reported statistically significant results suggesting caregivers of children with internalizing behaviour problems suffer from more parenting stress than caregivers of healthy children. Within the 2

studies, 2 (100%)[151, 157] investigated the association between mothers and child health condition, 1 (50%)[157] investigated the association between fathers and child health condition, and none investigated the association between "parents" (unspecified gender) and child health condition. Within each of these subgroups, statistically significant associations were found for totals of 1 (50%)[151] and 0 (0%) studies, respectively.

Only one additional remaining outcome had available data. There was some evidence that caregivers of children with internalizing behaviour problems suffer from more anxiety than caregivers of healthy children (1[135]/2[135, 150], 50%).

Caregivers of Children with Externalizing Behaviour Problems vs. Caregivers of Children with Internalizing Behaviour Problems

The included studies reported data on four outcomes. Few studies (n=4/46, 8.7%) compared caregivers of children with externalizing behaviour problems vs. caregivers of children with internalizing behaviour problems[135, 150, 151, 159]. A summary of the specific measurement scales used per outcome was provided earlier (Table 14).

Below, we present further information on our three main outcomes of interest (depression, psychiatric symptoms, and stress), after which study results of all other outcomes are briefly summarized.

Only 1 study compared caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems in terms of depression[150]. Findings from the comparison were not statistically significant, suggesting caregivers of

children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems do not differ on depression.

Only 1 study compared caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems in terms of psychiatric symptoms[151]. The comparison was not statistically significant, suggesting caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems do not differ on psychiatric symptoms.

Of the 2 studies that compared caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems on parenting stress[151, 159], none reported statistically significant results, suggesting caregivers of children with externalizing behaviour problems do not differ from caregivers of children with internalizing behaviour problems on parenting stress. Within the 2 studies, 2 (100%)[151, 159] investigated the association between mothers and child health condition, none investigated the association between fathers and child health condition, and none investigated the association between "parents" (unspecified gender) and child health condition.

On all remaining outcomes, the following associations were noted (number of studies supporting significant associations noted in brackets). There is some evidence that caregivers of children with internalizing behaviour problems suffer from more anxiety than caregivers of children with externalizing behaviour problems (1[135]/2[135, 150], 50%).

Findings from Meta-Analysis of Included Studies:

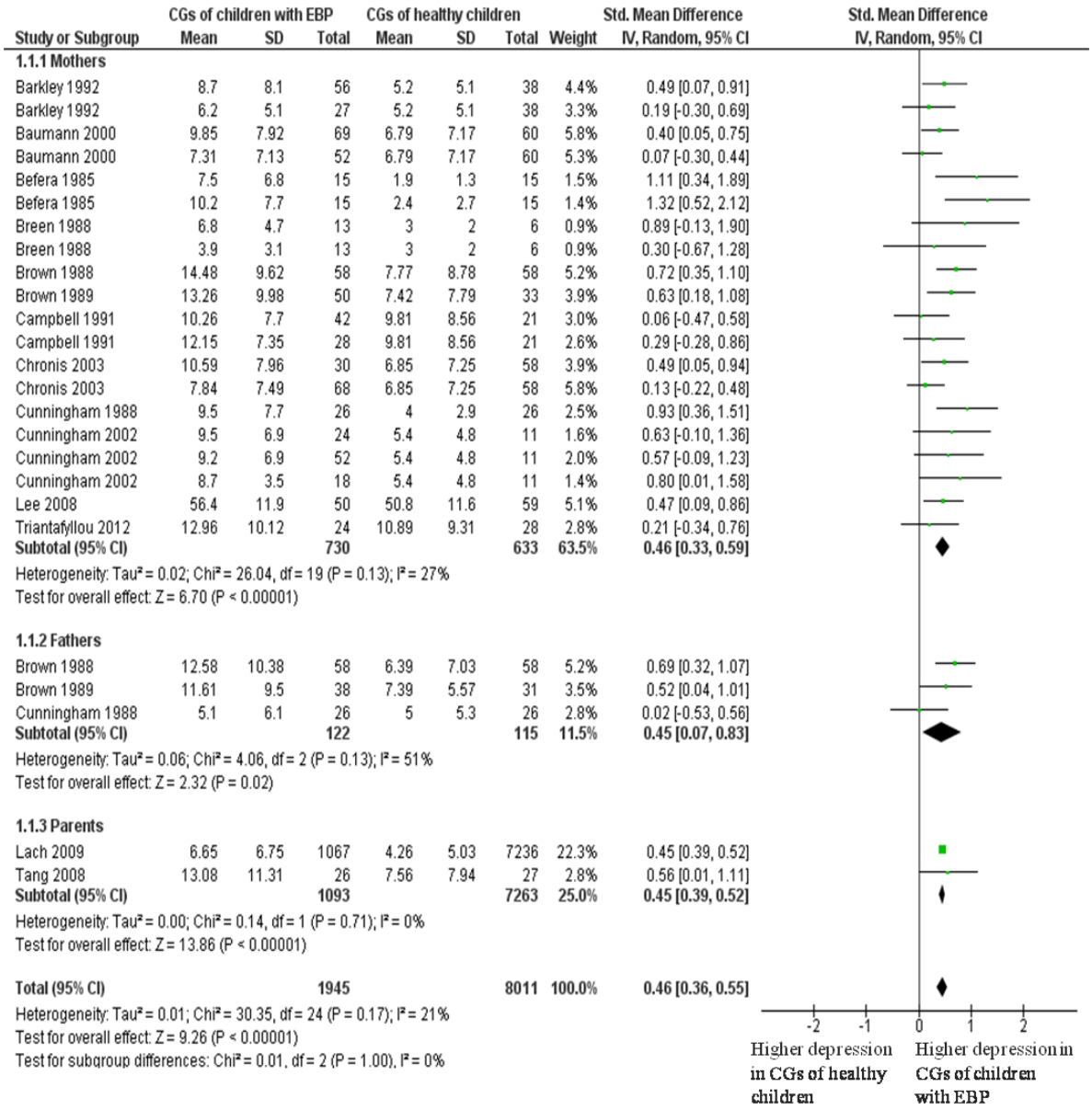
Forest plots for each meta-analysis are presented below. Meta-analyses were performed separately for each comparison of interest: caregivers of children with externalizing behaviour problems vs. caregivers of healthy children, caregivers of children with internalizing behaviour problems vs. caregivers of healthy children, and caregivers of children with externalizing behaviour problems vs. caregivers of children with internalizing behaviour problems. Within each comparison, we assess the impact on caregiver depression, psychiatric symptoms, and stress, respectively. We present findings from primary meta-analyses for all comparisons first, and heterogeneity is discussed at the end of the chapter. Throughout the analyses presented, standardized mean differences (SMDs) larger than 0 suggest greater presence of the outcome in the exposure group, while SMDs below 0 indicate greater presence of the outcome in the control group.

Caregivers of Children with Externalizing Behaviour Problems Compared to Caregivers of Healthy Children

Depression

Figure 4 presents a forest plot summarizing meta-analyses of the differences in depression scores using the standardized mean difference as the summary measure. A summary estimate of 0.46 (95% CI 0.36 to 0.55) suggests caregivers of children with externalizing behaviour problems were associated with higher depression scores than caregivers of healthy children. Subgroup analyses on mothers, fathers, and “parents” (unspecified gender) showed similar sized, statistically significant SMDs of 0.46 (95% CI 0.33 to 0.59), 0.45 (95% CI 0.07 to 0.83), and 0.45 (95% CI 0.39 to 0.52), respectively. The consistency of the results suggests caregivers of both genders are affected similarly by caring for a child with externalizing behaviour problems and both are more likely to exhibit depressive symptoms.

Figure 4: Presence of Depressive Symptoms in Caregivers of Children with Externalizing Behaviour Problems Compared to Caregivers of Healthy Children



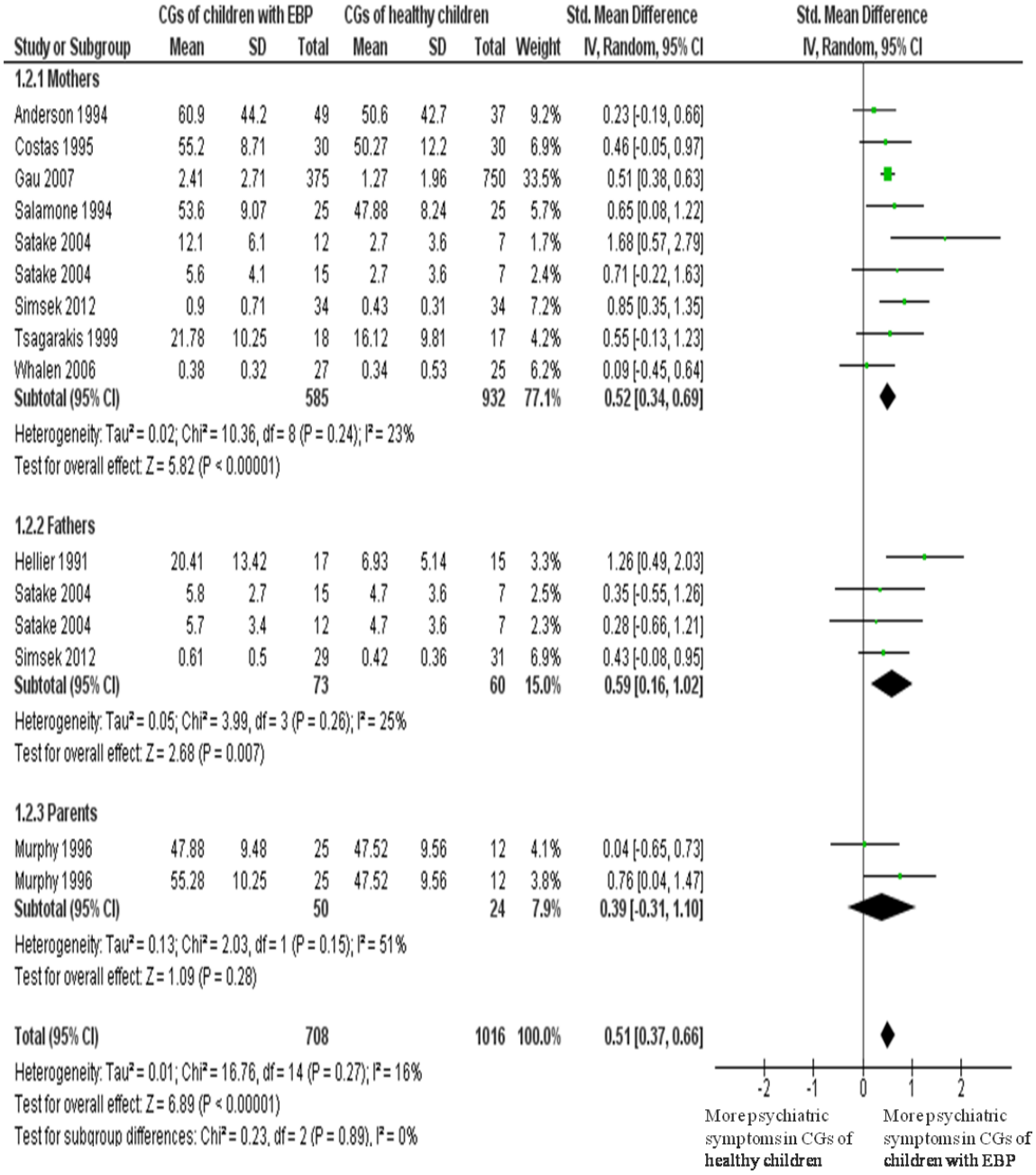
Standardized Mean Differences (SMD) of .2 are considered small, .5 are considered medium, and .8 are considered large[90]. Caregivers we divided into subgroups to represent caregiver groups that were 1) all female (mothers), 2) all male (fathers), or 3) mixed / non-specific (parents).

Psychiatric Symptoms

Figure 5 presents a forest plot summarizing the meta-analysis of between group differences of caregiver psychiatric symptoms scores. A statistically significant summary

estimate of 0.51 (95% CI 0.37 to 0.66) suggests caregivers of children with externalizing behaviour problems were associated with higher levels of psychiatric symptoms than caregivers of healthy children. Subgroup analyses on mothers, fathers, and "parents" (unspecified gender) showed summary SMDs of 0.52 (95% CI 0.34 to 0.69), 0.59 (95% CI 0.16 to 1.02), and 0.39 (95% CI -0.31 to 1.10), respectively. Within subgroup analyses, only the subgroups of studies evaluating outcomes in mothers and fathers showed statistically significant differences. The consistency of the results suggests caregivers of both genders are affected similarly by caring for a child with externalizing behaviour problems and both are more likely to present psychiatric symptoms.

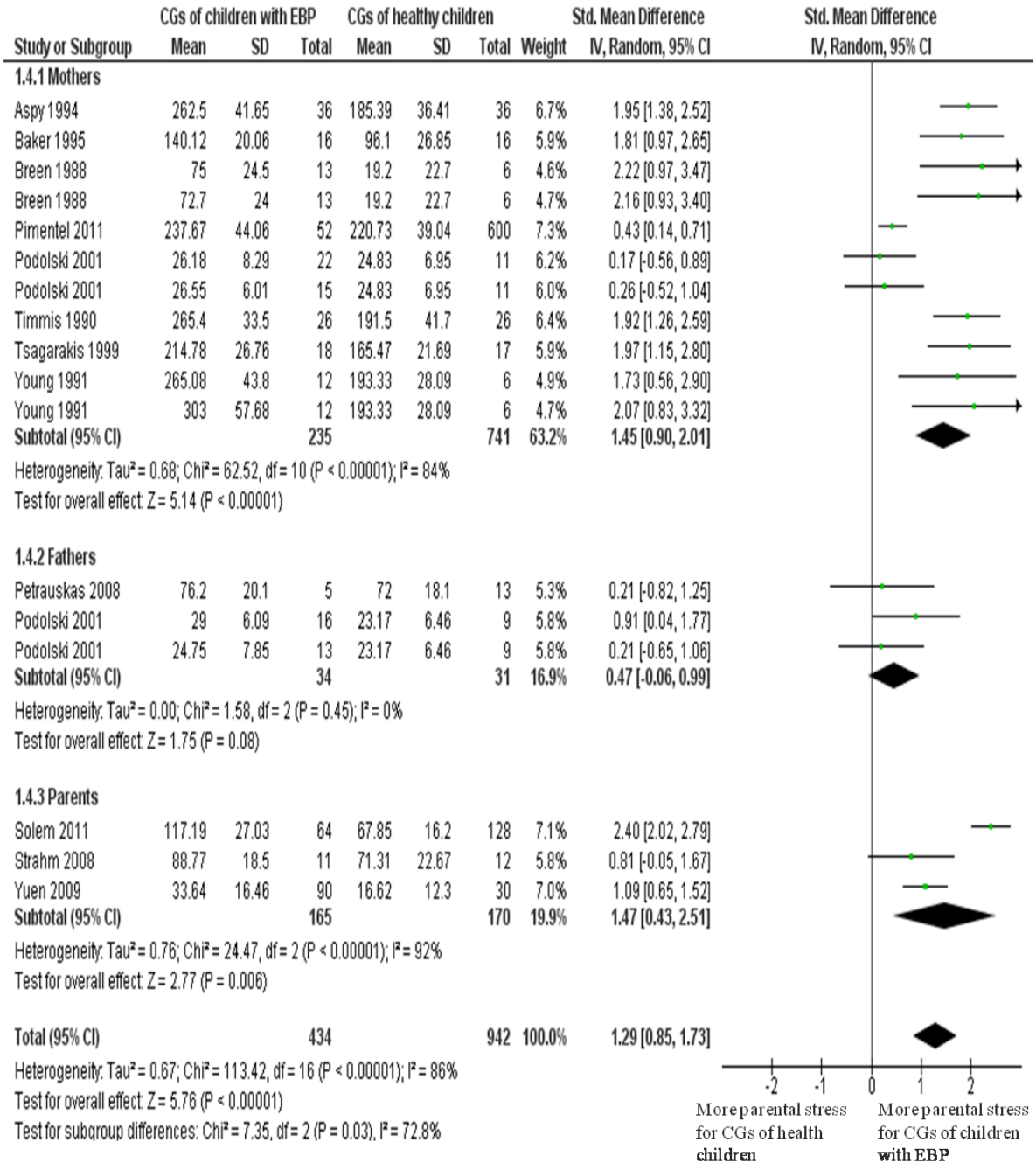
Figure 5: Presence of Psychiatric Symptoms in Caregivers of Children with Externalizing Behaviour Problems Compared to Caregivers of Healthy Children



Parenting Stress

Figure 6 presents a forest plot summarizing the meta-analyses performed on parenting stress scores using SMD as the summary measure. A statistically significant summary estimate of 1.29 (95% CI 0.85 to 1.73) suggests caregivers of children with externalizing behaviour problems have higher levels of parenting stress than caregivers of healthy children. Subgroup analyses on mothers, fathers, and "parents" (unspecified gender) showed summary SMDs of 1.45 (95% CI 0.9 to 2.01), 0.47 (95% CI -0.06 to 0.99), and 1.47 (95% CI 0.43 to 2.51), respectively. Within subgroup analyses, only the subgroups of studies evaluating outcomes in mothers and parents were statistically significant, and showed notably different summary estimates than the subgroup of fathers. The statistical significance of the "parents" subgroup further suggests stress impacts the caregiver, but we can make no assumptions regarding gender of the caregivers. The results suggest mostly female caregivers are affected by caring for a child with externalizing behaviour problems and both are more likely to present parenting stress.

Figure 6: Presence of Parenting Stress in Caregivers of Children with Externalizing Behaviour Problems Compared to Caregivers of Healthy Children

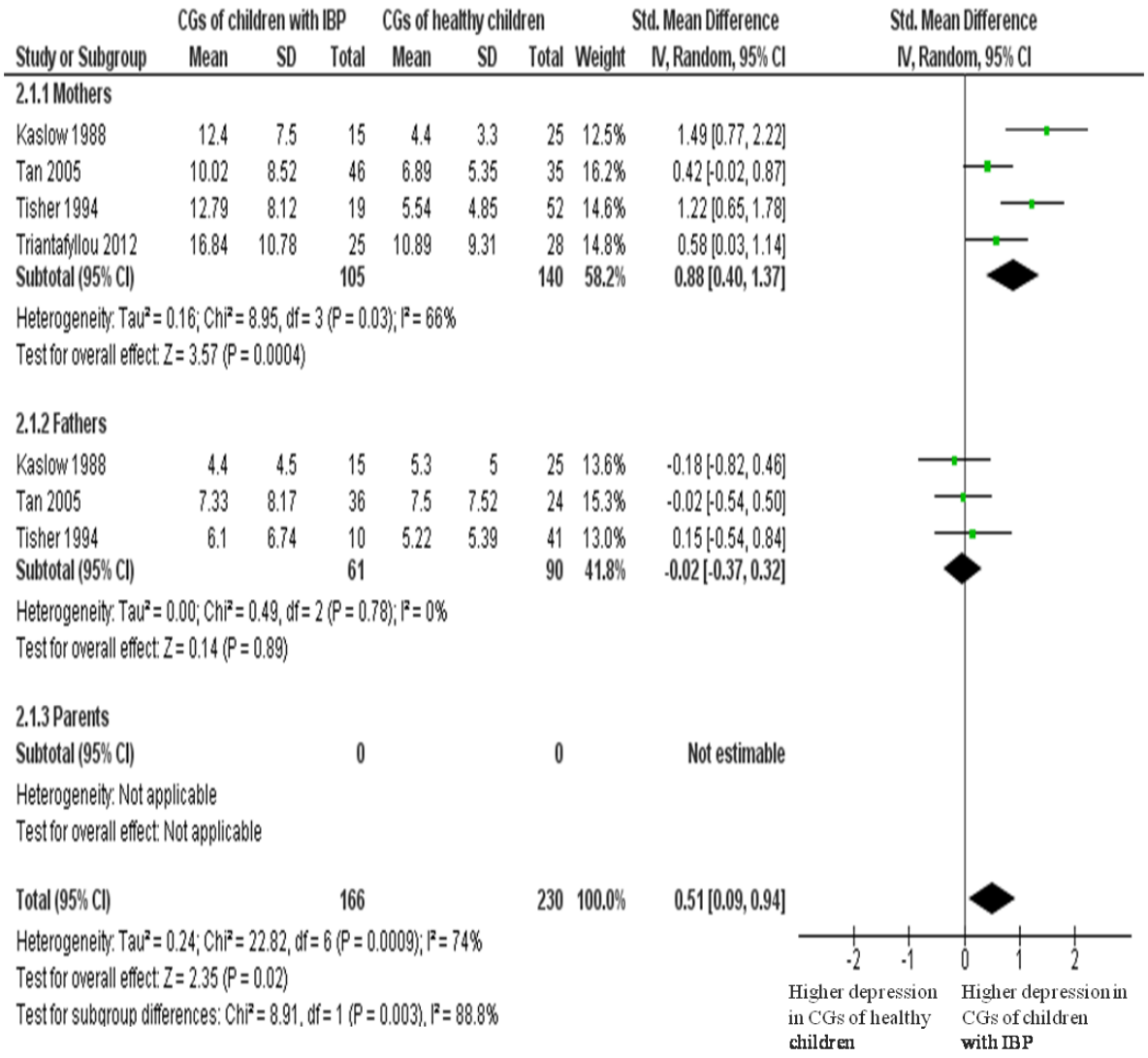


Caregivers of Children with Internalizing Behaviour Problems Compared to Caregivers of Healthy Children

Depression

Figure 7 presents a forest plot summarizing the meta-analyses performed on depression scores using SMD as the summary measure. A statistically significant SMD of 0.51 (95% CI 0.09 to 0.94) suggests caregivers of children with internalizing behaviour problems have higher depression scores than caregivers of healthy children. Subgroup analyses on mothers and fathers were associated with summary estimates of 0.88 (95% CI 0.40 to 1.37) and -0.02 (95% CI -0.37 to 0.32), respectively. Within subgroup analyses, only the subgroups of studies evaluating outcomes in mothers were associated with statistically significant differences between exposure groups. Results suggest that mothers' depressive symptomatology is impacted by caring for a child with internalizing behaviour problems while fathers' depressive symptomatology is not.

Figure 7: Presence of Depressive Symptoms in Parents of Children with Internalizing Behaviour Problems Compared to Parents of Healthy Children

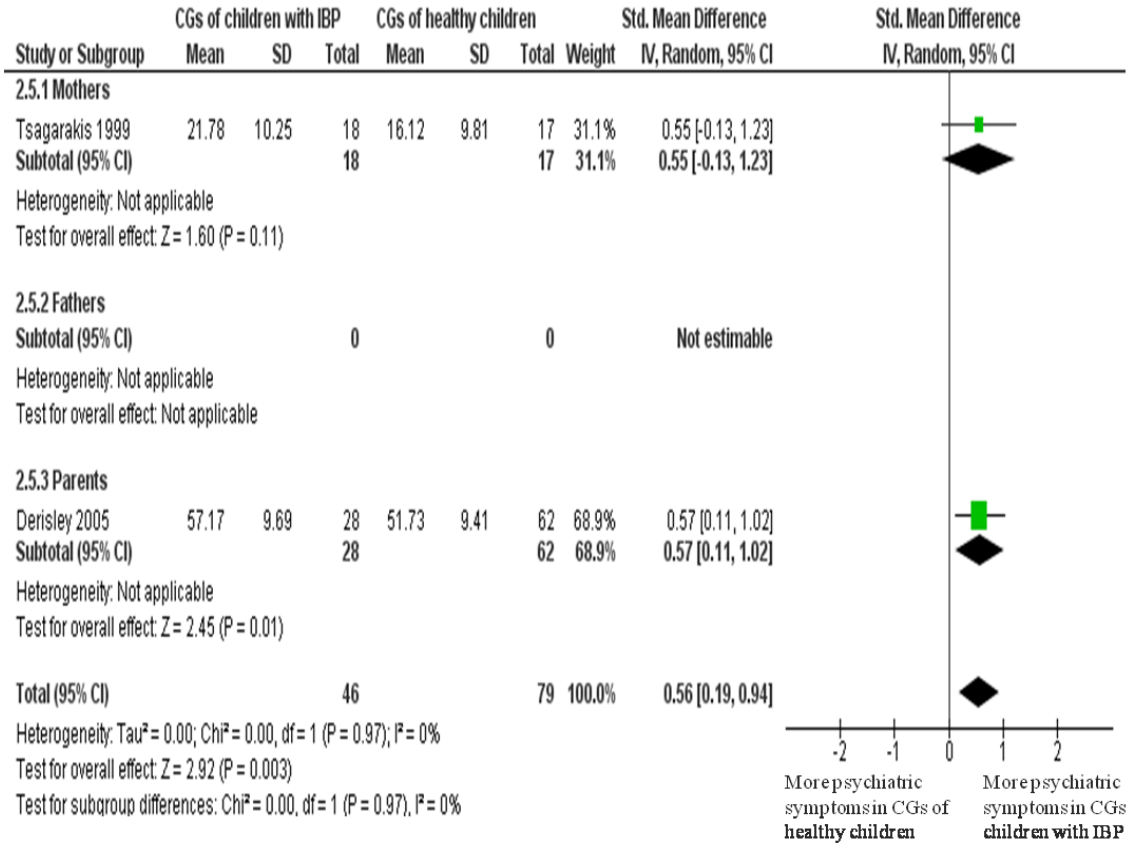


Psychiatric Symptoms

Figure 8 presents a forest plot of the available data and findings from meta-analysis of differences in psychiatric symptoms scores using SMD as the summary measure. A statistically significant summary estimate of 0.56 (95% CI 0.19 to 0.94) suggests caregivers of children with internalizing behaviour problems have higher levels of psychiatric

symptoms than caregivers of healthy children. No subgroup had more than one study with available data.

Figure 8: Presence of Psychiatric Symptoms in Caregivers of Children with Internalizing Behaviour Problems Compared to Caregivers of Healthy Children

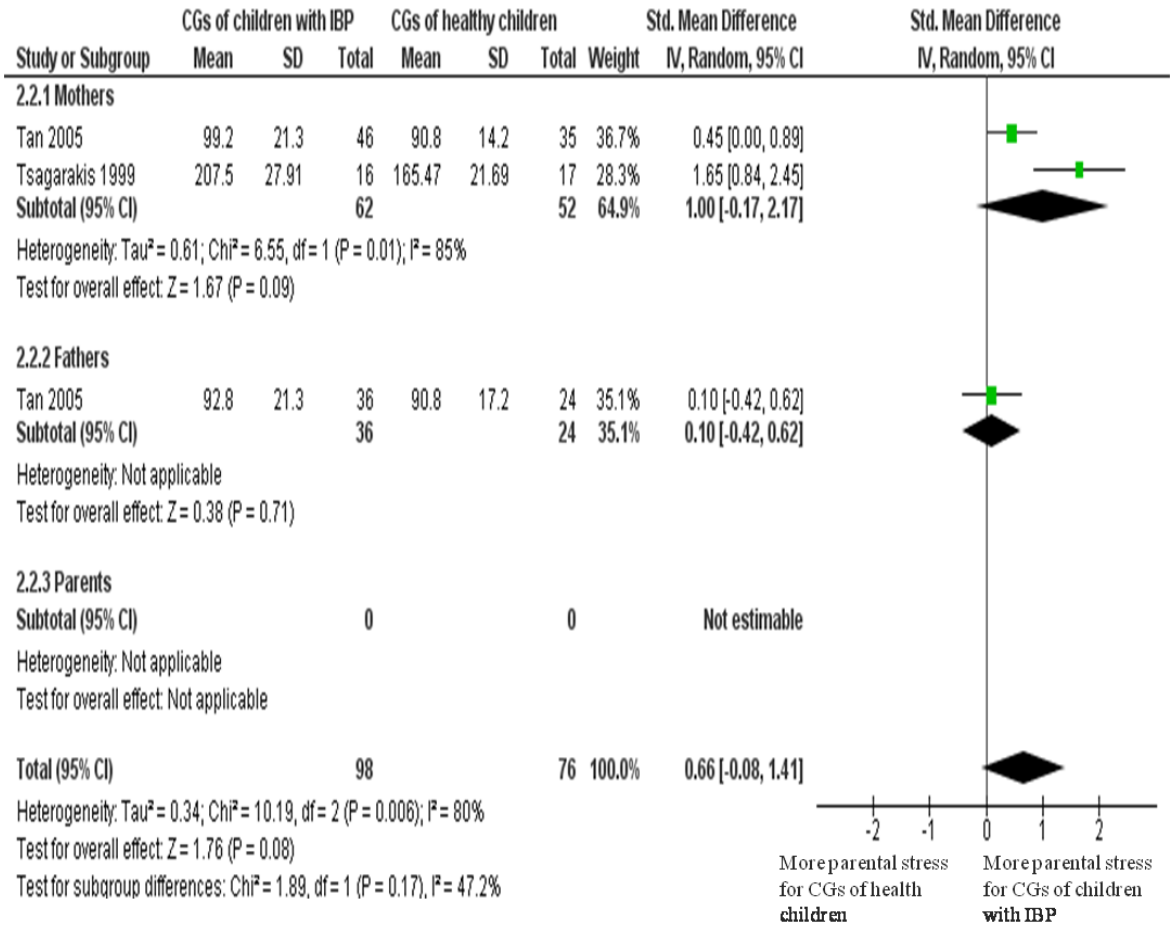


Parenting Stress

Figure 9 presents a forest plot summarizing the available data and meta-analyses for parenting stress scores using SMD as the summary measure. A summary estimate of 0.66 (95% CI -0.08 to 1.41) suggests no difference between caregivers of children with internalizing behaviour problems and caregivers of healthy children on parenting stress. A

subgroup analysis on mothers' data produced a summary estimate of 1.00 (95% CI -0.17 to 2.17), which was not statistically significant. Based on limited data, the results suggest caregivers of children with internalizing behaviour problems do not present more parenting stress than caregivers of healthy children, regardless of caregiver gender.

Figure 9: Presence of Parenting Stress in Caregivers of Children with Internalizing Behaviour Problems Compared to Caregivers of Healthy Children



Caregivers of Children with Externalizing Behaviour Problems Compared to Caregivers of Children with Internalizing Behaviour Problems

Depression

Only one study[150] provided data comparing caregivers of children with externalizing behaviour problems to caregivers of children with internalizing behaviour problems in terms of depression. A standardized mean difference of -0.36 (95% CI -0.93 to 0.20) was found, suggesting insufficient evidence of a difference between the groups on depressive symptomatology.

Psychiatric Symptoms

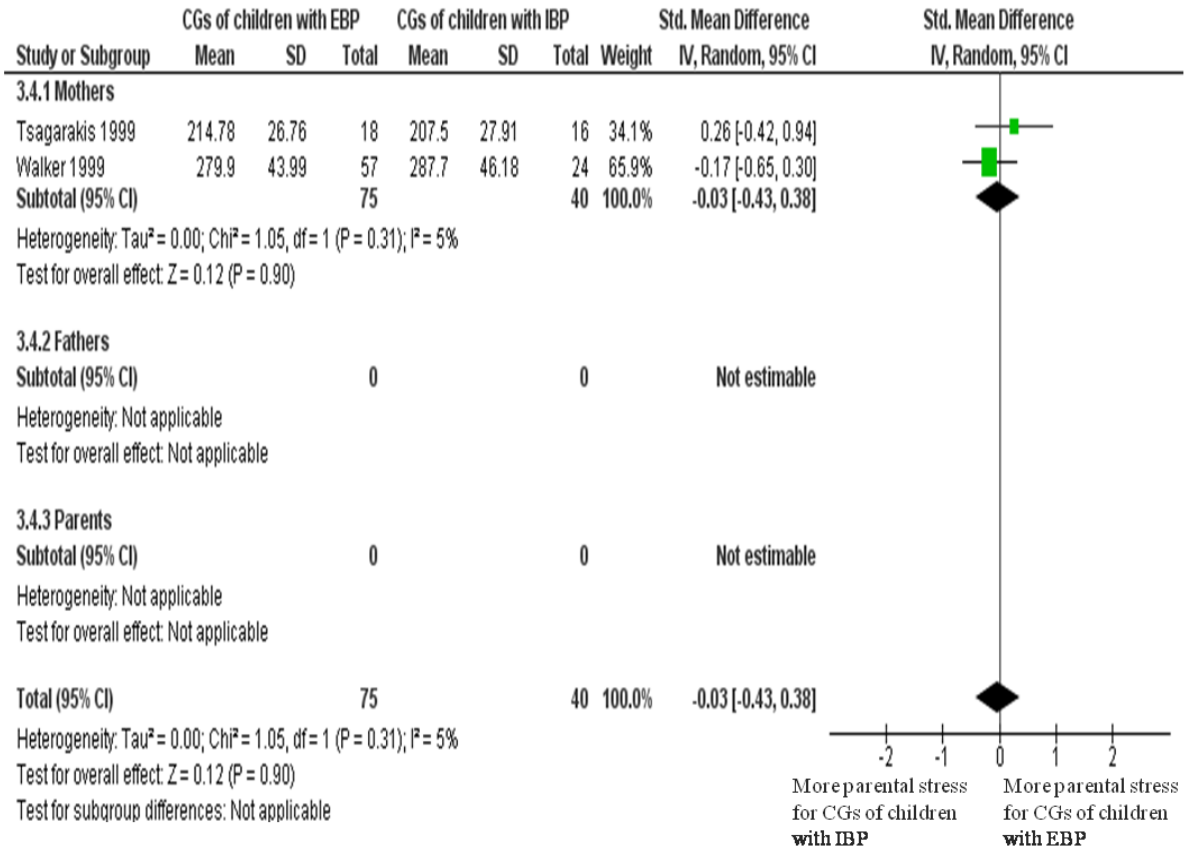
Only one study[151] provided data regarding a comparison of caregivers of children with externalizing behaviour problems relative to caregivers of children with internalizing behaviour problems in terms of psychiatric symptoms. A standardized mean difference of -0.58 (95% CI -1.27 to 0.11) was found, suggesting insufficient evidence of a difference between the groups on psychiatric symptoms.

Parenting Stress

Figure 10 presents a forest plot of the available data and meta-analysis for parenting stress scores. A summary SMD of -0.03 (95% CI -0.43 to 0.38) suggests no difference between caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems on parenting stress. All data was from studies where the caregivers were mothers. The results suggest caregivers of children with externalizing

behaviour problems do not present more parenting stress than caregivers of children with internalizing behaviour problems.

Figure 10: Presence of Parenting Stress in Caregivers of Children with Externalizing Behaviour Problems Compared to Caregivers of Children with Internalizing Behaviour Problems



Assessment of Heterogeneity in Meta-Analyses:

All meta-analyses that were associated with I^2 values of 50% or more were investigated for potential sources of heterogeneity. High overall heterogeneity was found in 3 of the 7 meta-analyses performed. We assessed heterogeneity between the studies in terms of both

participant and methodological characteristics in order to consider explanations as to why there might be differences from study to study measuring the same outcome. We considered comparisons between caregivers of children with externalizing behaviour problems and caregivers of healthy children first (1 of 3 meta-analyses showed an I^2>50%), and comparisons of caregivers of children with internalizing behaviour problems and caregivers of healthy children second (2 of 3 meta-analyses showed an I^2>50%). For studies comparing caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems, we only assessed heterogeneity for parental stress since it was the only outcome with more than one study (0 of 1 meta-analysis showed an I^2>50%).

We first assess heterogeneity where caregivers of children with externalizing behaviour problems were compared to caregivers of healthy children.

For studies assessing caregiver depression, only the subgroup of studies evaluating outcomes in fathers was associated with a high measure of heterogeneity (I^2 = 51%). This finding may be a consequence of the fathers' marital status in the study by Cunningham et al. (1988)[137]. Within this study, all participating fathers were married, and it is possible that in such situations the father is not the primary caregiver. This could suggest that fathers of ADHD children might show a pattern similar to control children (as indicated by means of 5.1 (ADHD) vs. 5.0 (Control)).

For studies assessing presence of psychiatric symptoms in caregivers, only the subgroup of studies evaluating outcomes in parents was associated with a high measure of heterogeneity (I^2 = 51%). However, only one study evaluated this comparison[142], within

which there were two different exposure groups (children with ADHD, children with mild ADHD). This suggests heterogeneity was likely due to the severity of the condition, where mild ADHD may not be severe enough to impact the caregivers to the same extent.

Finally, for studies assessing parental stress, both the subgroup of studies evaluating outcomes in mothers and the subgroup of studies evaluating outcomes in parents were associated with a high measure of heterogeneity (I^2 = 84% and 92%, respectively). Regarding the mother subgroup, one study[48] was the only one where most caregivers had not finished high school, suggesting potentially lower socioeconomic status (SES), where the effects of child behaviour on parental stress are confounded by low SES. The other study[144] contributing to heterogeneity was the only one to have assessed both male and female caregivers, suggesting that the father outcomes pooled with mother outcomes may have mitigated the effects. As seen in the father subgroup, effects were non-significant. Regarding the parents subgroup, most studies recorded similar effects, that is that parents of children with externalizing behaviour problems show more stress than parents of healthy children. However, the heterogeneity may stem from their differences in effect sizes. One study[49] had an effect size much higher than the others within the comparison. It was the only study not done within the United States, and may point to cultural differences within parental supports.

Univariate meta-regression analyses were conducted to explore whether adjustments for average child age or proportion of male children could explain between-study variation, however findings from these analyses did not provide additional insight.

We next assess heterogeneity where caregivers of children with internalizing behaviour problems were compared to caregivers of healthy children.

For studies assessing caregiver depression, only the subgroup of studies evaluating outcomes in mothers was associated with a high measure of heterogeneity ($I^2 = 66\%$). Looking at the studies included in this analysis, several factors could play a role. First, all four studies[150, 156-158] were conducted in different countries (US[156], Malaysia[157], Australia[158], and Greece[150]), with studies in the US and Australia showing similar effect sizes compared to each other, and the studies in Malaysia and Greece showing similar effect sizes compared to each other. Furthermore, one of these studies[150] is the only one to classify children as based on scale properties of "Internalizing" instead of using clinical diagnosis. Two studies[157, 158] recruited their respective control group and experimental group within the same type of setting. Interestingly, one of these studies did not demonstrate a statistically significant effect[157], while the other one did[158]. Finally, one study[158] used self-reported data to classify children as depressed while all other studies used medical diagnoses.

Finally, for studies assessing parental stress only the subgroup of studies evaluating outcomes in mothers was associated with a high measure of heterogeneity ($I^2 = 82\%$). Upon further inspection, one of the studies[151] had a higher proportion of male children and further adjusted analyses for SES, psychological distress, and medical problems, which may have contributed to the observed heterogeneity between studies.

When assessing studies comparing caregivers of children with internalizing behaviour problems against caregivers of healthy children, too few studies were available to consider meta-regression analyses.

Meta-analyses comparing caregivers of children with internalizing behaviour problems with caregivers of children with externalizing behaviour problems were not associated with high levels of heterogeneity.

In addition to the existing heterogeneity between studies, other factors may also impact the interpretation of our results. First, we included clinical diagnoses in our definition of children with behaviour problems instead of looking purely at internalizing symptoms and externalizing symptoms. While these conditions can be classified as primarily externalizing or internalizing, other symptoms of the condition may impact caregivers differently than when children only present broad internalizing or externalizing behaviour problems. Furthermore, while child behaviour problem severity was recorded during data collection, this information was not consistently available from included studies; given this limitation as well as our limited number of studies, this information could not accounted for in our analyses.

Summary of Findings:

This systematic review sought to identify studies that presented relevant information toward establishing an understanding of the caregiver health effects that can occur from providing care for children with externalizing and internalizing behavior problems. The body of evidence identified from our search spanned a broad time frame and was diverse in terms

of methodological and participant characteristics. Funnel plots investigation revealed no strong evidence of publication bias. The extent of available information was limited for all three of our comparisons of interest, with the greatest abundance available for comparisons between caregivers of children with externalizing behavior problems versus caregivers of healthy children. Considerably less data were found for comparisons of the latter group relative to caregivers of children with internalizing behavior problems, as well as for comparisons between caregivers with internalizing versus externalizing behavior problems. Data for other outcomes was sparse. All studies were observational and were associated with certain limitations in terms of reporting and design. Results from meta-analyses generally support the notion of increased health effects for caregivers of children with internalizing and externalizing behavior problems in terms of depression, psychiatric symptoms, and parental stress. Furthermore, there were some indications of differences on effects between mothers and fathers, wither mothers typically manifesting a larger effect than fathers. Finally, there were no indications of different effects of child externalizing behaviour problems compared to child internalizing behaviour problems on caregiver physical and psychological health, based on information from the systematic review.

CHAPTER 4: DISCUSSION

Child behaviour problems have been suggested as being important determinants of caregiver health[44, 47]. While this association has often been identified as being important, it has usually been demonstrated through small scale, clinical studies. Few studies have investigated the association between child behaviour problems and caregiver health at a population level[18, 21]. Furthermore, there have been few efforts to summarize the literature regarding associations between child behaviour problems and various caregiver outcomes, differences between mothers and fathers in outcomes, and associations on caregiver mental and physical health as children get older. The majority of the literature focuses on the associations between child behaviour problems and caregiver psychological health, while only few studies have investigated the association with caregiver physical health[18, 21]. Finally, while the literature does point to behaviour problems being an important factor regarding caregiver health, it was important to differentiate behaviour problems by separately examining the associations between internalizing and externalizing behaviour problems and caregiver health.

The aims of this dissertation were to summarize the associations between both internalizing and externalizing child behavioural problems and caregivers' health, and secondly to examine these associations in more detail using longitudinal data collected on a nationally representative sample of Canadian children.

To meet our objectives, two different studies were performed. The first used a longitudinal national representative sample to assess the association between both child

internalizing and externalizing behaviour problems and both caregiver physical and psychological health while accounting for important covariates. Furthermore, the repeated nature of the survey allowed us to investigate potential trends regarding the associations with caregiver health over time via cross sectional analyses. The second study was a systematic review with meta-analyses focused on the effect of child behaviour problems on caregiver health outcomes. Systematically reviewing the evidence allowed us to identify the range of caregiver physical and psychological health outcomes that have been investigated by published studies, while review of study findings and performance of meta-analyses allowed us to assess the magnitude of the association between both internalizing and externalizing child behaviour problems on these different outcomes. A summary of findings from each of these research components from this dissertation follows.

National Data Analyses

In order to determine the contribution of child behaviour problems to both caregiver self-reported depression and caregiver physical health, we used national level data to compute three different models on both cross-sectional and longitudinal samples. The use of national data further allowed us to control for covariates, such as socioeconomic and demographic variables. We assessed the impact of child chronic health conditions with any behaviour problem, chronic health conditions alone, both types of behaviour problems, externalizing behaviour problems, and internalizing behaviour problems on caregiver health. This allowed us to disentangle the effects of each health status in their contribution to caregiver health. Furthermore, it also permitted us to examine whether the complexity of child health status affected the caregivers differently (e.g. having both types of behaviour problems creating a bigger effect on caregiver health than either behaviour problem by themselves).

Caregiver depression was significantly associated with the child's behaviour problems. Child externalizing behaviour problem status had the biggest association with caregiver depression among all the different child health groups. Results also suggest an important impact of internalizing behaviour problems on caregiver psychological health. Socioeconomic and demographic covariates, namely income and marital status, attenuated the association between child health condition and caregiver depression. Nevertheless, results suggest an important and significant association between child behaviour problems and caregiver psychological health even after controlling for socioeconomic and demographic variables.

Caregiver self-reported health was significantly associated with child health condition as well. Namely, child externalizing behaviour problems were significantly associated with caregiver self-reported health. The same association was not found for caregivers of children with internalizing behaviour problems. While behaviour problems by themselves may significantly impact caregiver self-reported health, it appears as if when combined with a chronic health condition they further strenghten this observed association. Caregivers of children with a chronic health condition and a behaviour problem were almost three times more likely to report poor physical health (OR = 2.73). Some chronic health conditions (e.g. cerebral palsy) require caregivers to exert more physical energy then caregivers of healthy children in order to ensure proper care for their child (e.g. assisting with mobility), which impacts physical health (Davis et al., 2010). We hypothesize that this, coupled with externalizing behaviour problems (e.g. refusing to be bathed) creates a situation which becomes extremely physically demanding to the caregivers, which then leads to lower self-

reported health. The logistic model explained 3.85% of the variance regarding caregiver self-reported physical health. While explained variance was small, we were mainly interested in the association between child behaviour problems and caregiver health. We would expect that larger contributors to caregiver physical health would be variables such as BMI, amounts of exercise, and diet, things that were not included in the NLSCY. Nevertheless, we still noted an important association, albeit small, between child behaviour problems and caregiver health.

Varying time effects were observed when investigating the association of caregiver depression with child behaviour problems within our longitudinal sample. Both the strength of association of internalizing and externalizing behaviour problems with caregiver depression differed over time in magnitude and significance. On the other hand, socioeconomic variables showed little variability over time. Demographic variables showed little to not time effects, except for caregiver age which increased in magnitude over time. While all these patterns are interesting, it is hard to disentangle why these patterns are so wildly different across each child health condition and why the observed associations of the different child health statuses peak and drop at different ages. It is possible that as the child is diagnosed with a behaviour problem, he receives treatment for it which attenuates the effects on caregiver health over time.

Varying time effects were observed when investigating the association of caregiver self-reported health with child behaviour problems within our longitudinal sample. Once again, both the observed associations of internalizing and externalizing behaviour problems differed over time in magnitude and significance. Furthermore, socioeconomic variables showed little

variability over time, except for marital status which demonstrated a decreasing trend. There were no indications of time effects for demographic variables. Nevertheless, the association between child health condition and caregiver self-reported health remained significant at most time points.

Overall, the association between child behaviour problems and caregiver physical and psychological health was consistent and significant across most models. The relationship remained significant even after controlling for important socioeconomic and demographic variables. Indirect associations between behaviour problems and caregiver health have yet to be measured and may offer better insights in the mechanisms through which child behaviour problems affect caregiver physical and psychological health.

Systematic Review and Meta-Analysis

Within our systematic review and meta-analyses, consistent associations between child internalizing and externalizing behaviour problems and caregiver health effects were found for depression, psychiatric symptoms, and parental stress. Most of the included studies explored the impact of externalizing behaviour problems on caregiver health. Few studies explored the impact of internalizing behaviour problems, and even fewer studies permitted the assessment of the impact of externalizing behaviour problems compared to internalizing behaviour problems on caregiver health.

In the set of 46 studies meeting our eligibility criteria, we found a total of 10 different outcomes that had been assessed. Amongst them, 9 were related to psychological health and only 1 was related to physical health. As there was only 1 study investigating the association

of children's behavior problems with caregiver physical health, we performed no meta-analyses related to this outcome. This does however point to an important area for further research since the impact of child behavior problems on caregiver physical health outcomes appears to be an under researched topic. Within the 9 identified psychological health outcomes, only 3 were reported by 10 or more studies: parental depression, psychiatric symptoms, and parental stress. Our meta-analyses focused on these three outcomes while providing brief narrative summaries for the others. The numbers of studies and caregivers available for each of our comparisons of interest were small; more research is needed to further elucidate possible differences. Findings from our risk of bias evaluations suggested that studies were associated with some common limitations in terms of efforts to account for confounding. Furthermore, variations in the assessment of child behaviour problem, either by scale report or medical diagnosis, were noted across studies.

Summary estimates from meta-analyses suggested that increased caregiver depression was found to be associated with both internalizing and externalizing child behaviour problems. Only one study[150] (n=49) had data comparing depression outcomes in caregivers with externalizing versus internalizing behavior problems, with no evidence of a difference on caregiver outcomes.

Subgroup analyses by caregiver gender suggested that fathers may experience increased depressive symptoms when raising a child with externalizing behavior problems, but not a child with internalizing behavior problems. Findings regarding mothers showed increased depression in both analyses of internalizing and externalizing child behavior problems.

Findings regarding studies assessing the effect on both mothers and fathers simultaneously showed increased depression as well.

Presence of increased caregiver psychiatric symptoms was found to be associated with both internalizing and externalizing child behaviour problems compared to healthy children based on our meta-analyses. Again only one study had data informing a comparison between caregivers of children with externalizing behaviour problems and caregivers of children with internalizing behaviour problems; no differences were found with both having negative effects on caregivers.

Subgroup analyses revealed few differences. Regarding caregivers of children with externalizing behaviour problems, both mothers and fathers were more likely to demonstrate increased psychiatric symptoms. Subgroup analyses for comparisons of caregivers of children with internalizing behaviour problems compared to caregivers of healthy children provided little insight, as most were restricted to single studies.

Increased parental stress was found to be statistically significantly associated with externalizing behaviour problems. The magnitude of effect was the highest of all three outcomes studied. We did not find a statistically significant association with internalizing behaviour problems; however, the observed effect for this comparison was similar in magnitude to that of the association of child internalizing behaviour problems with both depression and psychiatric symptoms. Results suggest data from additional caregivers may achieve statistical significance for this comparison at a future time. Two studies provided data comparing caregivers of children with externalizing behaviour problems to caregivers of

children with internalizing behaviour problems, both reporting data from mothers only; no evidence of a difference between the groups was found. Subgroup analyses were again limited due to the small numbers of studies and participants; however, there were some indications that father stress may not be significantly impacted by child behaviour problems.

Overall, findings from our systematic review and meta-analyses support the presence of a relationship between caregiver health (namely the presence of depression, psychiatric symptoms, and parental stress) (SMD_{range} = 0.46 to 1.29, suggesting near medium to large effects[90]) and children with behaviour problems. Furthermore, there are many more studies investigating the impact of externalizing behaviour problems on caregiver health than there are studies investigating the impact of internalizing behaviour problems on caregiver health. We believe this is because our definition of child externalizing behaviour problems included ADHD, which is heavily represented in our sample of studies investigating children with externalizing behaviour problems (31 out of 41 studies). There is some evidence that mothers are more affected than fathers and that caregivers caring for a child with externalizing behaviour problems are more affected than caregivers caring for a child with internalizing behaviour problems regarding parental stress. Due to the small number of studies in the area, it is not possible to comment about the impact on caregiver physical health.

Subgroup analyses on caregiver gender revealed interesting differences. Notably, it appears as if outcomes reported for fathers demonstrate less of a difference than outcomes reported for mothers. This may be due to the role that each parent plays with regard to parenting their child. In many cases, for example, in survey data collection, it is typically the mother which is considered most knowledgeable about the child[82]; therefore, mothers likely

represent the child's primary caregiver. It is possible that the primary caregiver (and not mothers specifically) is further affected by the child's behaviour problem than the other parent, regardless of gender. As we did not explore this specifically, further studies are needed to explore the potential differences on health outcomes between the child's primary caregiver and the other parent regardless of gender.

Limitations

A range of study limitations are worthy of mention.

First, the systematic review did not consider the complexity of each child health condition within each paper. Literature suggests that child health severity (e.g. increased service use, the presence of an activity limitation) may lead to increasingly detrimental caregiver health effects[1]. It is possible that certain conditions within each child internalizing and externalizing behaviour problem spectrums may contribute to higher effects on caregiver health outcomes. This was partially addressed in our national data analyses; however, we did not address variation in complexity within health conditions within this review. A separate review would be needed to address this issue on a meta-analytical level. Our analyses were planned a priori to focus on establishing the extent of the relationship between internalizing and externalizing children's behavioural conditions and caregiver health.

Second, many papers included in our systematic review primarily focused on the child rather than on the parent. In some studies, caregiver health variables were addressed only in secondary analyses. This is likely a primary reason as to why some of the included studies contained limited information regarding the caregivers' demographics. Unknown differences

among the caregivers could possibly explain some of the between-study variability in summary measures observed. Nevertheless, we did attempt to address this limitation by requiring that poor caregiver health was not manifested prior to the start of the child's behaviour problem.

Third, while we attempted to rule out studies in which caregivers had poor health prior to assessing that the child had a behaviour problem, it remains possible that within the included studies certain caregivers had poor health before the children demonstrated behaviour problems. Therefore, it is possible that some studies within our meta-analyses represent situations in which caregiver health was poor prior to the manifestation of the child's behaviour problem. In these cases, evidence would suggest that poor caregiver health affects child behaviour problems rather than the opposite. That is, our systematic review currently does not allow us to comment on the direction of the relationship or whether it is unidirectional or bi-directional. Nevertheless, to reject all studies in which we are uncertain of caregiver health status prior to the manifestation of child behaviour problems would have dramatically decreased the number of included studies. Therefore, we decided to include studies in which child behaviour problem and caregiver health were measured at the same time, or if child behaviour status was determined prior to poor caregiver health.

Fourth, in our national data analysis, our definition of child behaviour problems used a scale which contained 4 externalizing behaviour problem subscales but only 1 internalizing behaviour subscale. Therefore, it is possible that we ended up classifying more children as having externalizing behaviour problems due to the higher chance of them scoring 2 standard deviations above the mean on any of the 4 subscales rather than on just 1 subscale. In fact

children with externalizing problems represented a larger group than children with internalizing problems. However, there are some indications that externalizing behaviour problems are more prevalent than internalizing behaviour problems[160].

Fifth, our national data sample was originally designed to be representative of the population of children in Canada, but not of the population of caregivers. The NLSCY was created with the child as the unit-of-analysis and therefore we cannot guarantee the representativeness of the caregivers. While this distinction may affect general applicability of our findings on a population level, we do not expect this to have a major impact on the observed relations.

Sixth, while our national data analyses informally investigated time trends of the caregiver health effect, we did not use formal longitudinal modeling to empirically test these hypotheses due to limited resources. Our current analyses therefore do not allow us to comment conclusively on the temporality of caregiver health with child age. Further investigations would be needed using actual longitudinal models such as generalized estimating equations.

Seventh, certain important factors available in the NLSCY, such as parenting practices[161], were not included in our analyses. The decision to exclude these variables was often related to either non-consistent measurement over cycles or availability at different ages. For example, in regards to parenting practices, caregivers of children aged 10 – 11 were measured on different parenting scales than caregivers of children aged 12 – 15.

Eighth, one in four children was missing health condition status at baseline. Studies have shown that respondents are typically healthier than non-respondents[162, 163]. As such, there is potentially a systematic bias in our study. However, since non-respondents are typically not as healthy as respondents, this bias would lead to an underestimation of the differences between our "caregivers of healthy children" group and every other health condition group.

Ninth, our inclusion criteria were very stringent, leading to potentially excluding many pertinent articles. For example, Goodman et al., (2010)[68], who looked at the strength of the association between child psychopathology and maternal depression, used only 4 inclusion criteria and established an evidence base of 193 studies compared to our 47. However, it is to be noted that we limited which conditions a child could have to be considered as having a behaviour problems (leading us to exclude children with physical health problems, for example), while keeping caregiver outcomes unrestricted. Goodman et al., (2010)[68] restricted caregiver outcomes to depression but considered both child behaviour problems and emotional problems to represent child psychopathology.

Tenth, our definition of chronic conditions in our national data analyses included conditions which could be viewed as inherently internalizing or externalizing. For example, we considered children identified as having ADHD within the NLSCY as having a chronic condition. However, to be part of our chronic condition group, they also had to present an activity limitation. Nevertheless, there may still be an overlap between our chronic condition group and our behaviour problem groups.

Finally, while we were guided by the empirically-derived and tested model developed by Raina et al.[44], we cannot be certain of the causal nature of the relationships between our predictor variables and caregiver health outcomes. In part, this is because we did not account for temporality of the exposure and the outcome, and as such we can currently only comment on associations. Other studies have noted associations between child behaviour problems and the following: caregiver mental health[164], quality of attachment[165], low birth weight[166], and peer rejection[167]. As a result, unobserved variables could potentially explain our observed associations. Our current methodology does not allow us to pinpoint child behaviour problems as clearly causing caregiver physical and psychological health problems. Nevertheless, we do provide compelling evidence of an association between these variables.

Contributions

This project offers new insight regarding the contribution of child behaviour problems to caregiver health in several ways.

First, to the best knowledge of the research team, this is the first study to attempt to summarize the literature regarding the effect of child internalizing and externalizing behaviour problems separately on caregiver health outcomes. Other meta-analyses have looked at single outcomes (e.g. depression (Goodman et al., 2010)[68]) or have investigated behaviour problems within specific child conditions (e.g. cancer[76]).

Second, the national data analysis component of this thesis attempted to examine the associations betweem internalizing and externalizing child behaviour problems with caregiver health. The national data analysis further attempted to contrast these associations

with the observed associations between child chronic conditions and caregiver health. As such, we have a better understanding of which types of behaviour problems were associated with caregiver health.

Third, the national data analysis component of this thesis assessed the associations between child health status and caregiver health at three different time points. This allowed us to investigate potential associations and how caregivers may be affected over time. Furthermore, it allowed us to investigate whether the different child health statuses were associated with caregiver health differently over time.

Finally, the national data analysis component of this thesis is one of the few studies which investigated the impact of child behaviour problems on caregiver physical health. This study, however, further attempted to disentangle the effects of internalizing behaviour problems compared to externalizing behaviour problems. The meta-analysis component further attempted to clarify the effects of child behaviour problems on caregiver physical health, but unfortunately too few studies existed to permit this investigation.

Future Directions

Below, considerations are given to areas of research which still require further study.

More research is needed focusing on the contribution of child behaviour problems to caregiver physical health. While our national data analysis provides unique insight, it is not sufficient on its own to understand the impact behaviour problems may have on physical

health. More studies need to investigate the impact of child behaviour problems on physical health to demonstrate a consistent association (or lack thereof).

Second, further research is needed in determining the exact contribution of internalizing behaviour problems on caregiver physical health. Findings from our national data analysis pointed out that caring for children with internalizing behaviour problems may not be associated with caregiver physical health, a finding which our meta-analysis was not able to investigate due to too few studies. However, it should be noted that we may not have accurately been able to assess or detect differences in caregivers of children with internalizing behaviour problems in our national data analyses as well, as we only used one subscale to determine the presence / absence of these problems. Furthermore, we had little power to detect significant differences within this group. It is important to determine the impact of internalizing behaviour problems on caregiver health for three reasons: 1) the prevalence of internalizing problems, such as depression, is on the rise[168], 2) if they are associated with caregiver health, then many more caregivers will be affected than if only externalizing behaviour problems demonstrate an association, 3) if they are not associated, we can target interventions specifically for dealing with child externalizing behaviour problems. We were possibly unable to accurately capture internalizing behaviour problems and therefore are unable to speak to the association with caregiver health in definite terms. As such, more research is needed to determine if, how, and what types of internalizing behaviour problems might be associated with caregiver health.

Third, there is a need to investigate which mechanisms are at play when child internalizing and externalizing behaviour problems are associated with caregiver health.

Formal empirical investigations of theoretical models (e.g. stress process model[45]) would help elucidate this relationship. That is, we need to better understand the mechanisms of how behaviour problems are associated with caregiver health rather than only address the existence of a relationship.

Finally, further research is needed to disentangle association of gender and caregiver health compared to associations between the primary caregiver of the child and caregiver health. As explained earlier, the current paper points to the fact that observed gender differences in the meta-analysis may only be a proxy to the role of the parent as primary caregiver of the child vs. being the secondary caregiver.

This project has implications towards social policy. For example, there might be a need for better physical and psychological support systems for parents of children with behaviour problems as well as for parents of children with both a chronic health condition and a behaviour problem. Programs of at-home respite care could prove very beneficial to these parents and would allow for more flexible schedules and potentially for better overall health. Further establishing the different effects (if any) of externalizing and internalizing behaviour problems would help specify future interventions.

Overall Conclusions

Findings from the two components of this thesis suggest that caring for a child with behaviour problems is negatively associated with caregiver health. Our systematic review suggests that a paucity of studies have investigated the association between internalizing behaviour problems and caregiver health. However, our national data analysis provides

additional insights regarding the association between internalizing behaviour problems and caregiver physical and psychological health. From that analysis, it appears that internalizing behaviour problems may be associated with caregiver psychological health, but not caregiver physical health. In contrast, externalizing behaviour problems appear to be associated with both caregiver physical and psychological health. While caregivers of children with chronic health conditions appear to manifest a stronger association with caregiver health than caregivers of children with solely behaviour problems, caregivers of children with both a behaviour problem and a chronic health condition show the strongest association with caregiver health overall. This suggests that the mechanisms by which child health affects caregivers may differ based on the health condition. While we only demonstrated the association of internalizing behaviour problems having a decreasing impact over time, several child health conditions were significantly associated with caregiver outcomes even though a linear/gradient increase or decrease was not apparent. Nevertheless, our findings suggest a significant impact of both internalizing and externalizing behaviour problems on caregiver physical and psychological health over and above socioeconomic conditions.

Female caregivers of children with behavioral problems may be more likely to suffer from adverse caregiver health effects than their male counterparts. Findings from the systematic review component of this thesis provided some suggestion that fathers caring for a child with behaviour problems do not always show adverse health effects as do the mothers of children with behaviour problems. It is possible that it may not be gender that explains this difference, but rather the role of the mother and father within the family unit (e.g. whether or not they feel committed to their role as a parent[169], how much caregiving responsibilities they have, etc.). That is, in many cases, mothers may be the primary caregiver for the child[82], and

therefore may manifest poorer caregiver health due to their role as primary caregiver. That is, the role of primary caregiver may require more involvement than that of secondary caregiver, and caregiver gender may act solely as a proxy for the primary caregiving role within the family unit. The national data analysis attempted to disentangle these, as the caregivers (most frequently mothers) were the persons most knowledgeable about the child. Caregiver gender was typically not a significant predictor of caregiver health, except within the cross-sectional sample and at ages 10-11 when assessing the impact on caregiver depression. This lends some additional support to the hypothesis that it is the primary caregiving role, or the level of parental involvement or commitment, that contributes to poorer health[169] of mothers.

Child health status explained only a small amount of variance in the analyses of caregiver physical and psychological health. Socioeconomic variables typically explained greater proportions of variance. However, these socioeconomic variables and child health status are related. That is, the presence of a child health condition may lead to a higher financial burden[170] and perhaps to higher divorce rates (namely due to factors such as increased marital strain[170]); therefore, it is possible that child behaviour problems may not contribute directly to poorer caregiver health, but that the mechanisms through which it operates may be indirect by acting instead on socioeconomic factors or other psychological variables (e.g. self-worth), which may explain caregiver physical and psychological health.

Finally, the breadth of the literature indicates that while psychological health variables have been investigated widely regarding caregiver health, very few studies have actually looked at the association between child behaviour problems and caregiver physical health.

Some of the studies which have investigated caregiver physical health did so prior to the determination of a child behaviour problem[26]. That is, they proposed that caregiver physical health led to child behaviour problems rather than the opposite, which we proposed. Further research is needed to assess the temporality of the impact of child behaviour problems on caregiver physical health.

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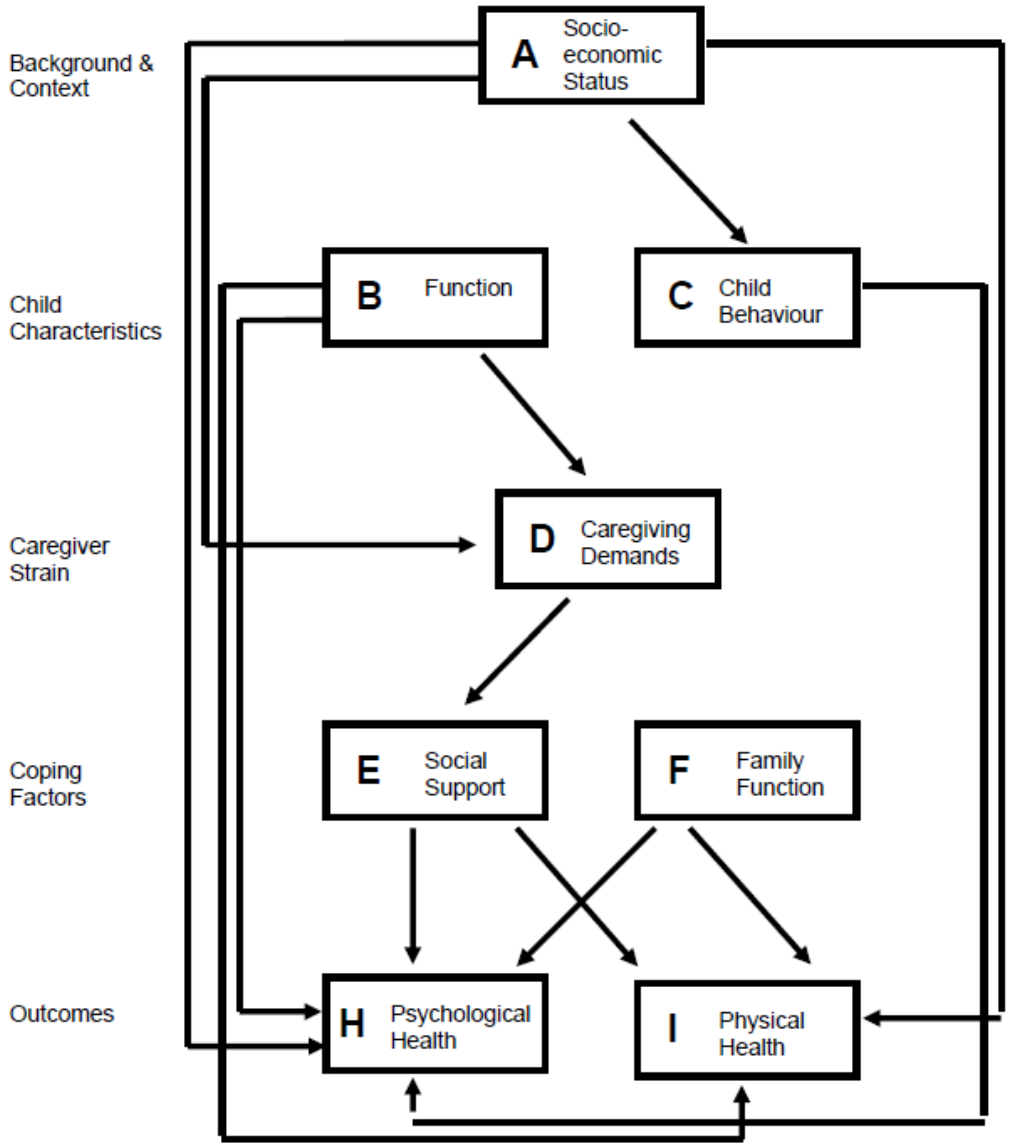
APPENDIX A – CAREGIVER HEALTH PATHWAY MODEL



APPENDIX B - SEARCH STRATEGIES

Medline:

---

1 exp parents/ (64956)
2 *family/ (24789)
3 *single parent family/ (221)
4 caregiver/ (18735)
5 1 or 2 or 3 or 4 (103866)
6 Child/ (1281856)
7 Child, Preschool/ (706083)
8 Child*.tw. (906718)
9 Adolescent/ (1498998)
10 adolesce*.tw. (152941)
11 6 or 7 or 8 or 9 or 10 (2509263)
12 Child Behavior Disorders/ (17460)
13 ((Child* or Adolesce*) adj4 internaliz*).mp. (911)
14 ((Child* or Adolesce*) adj4 externaliz*).mp. (1091)
15 ((internaliz* or externaliz*) adj4 behavio*).mp. (2074)
16 Anxiety/ (47691)
17 Depression/ (67532)
18 Somatoform Disorders/ (7382)
19 Social Isolation/ (10306)
20 Attention Deficit Disorder with Hyperactivity/ (17802)
21 "Attention Deficit and Disruptive Behavior Disorders"/ (1789)
22 Conduct Disorder/ (1925)
23 Oppositional defiant disorder.mp. (1041)
24 Hyperkinesis/ (3499)
25 Aggression/ (24985)
26 Conduct problem.mp. (165)
27 Juvenile Delinquency/ (6936)
28 Delinquent.tw. (2209)
29 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 (183022)
30 5 and 11 and 29 (7534)
31 limit 30 to (english or french) (7185)
32 limit 31 to yr="1978 -Current" (6646) (Actually 6655 at the time of the search)

Database: PsycINFO<1806 to January Week 5 2013>
Search Strategy:
---
1 exp parents/ (65738)
2 *family/ (18907)
3 caregivers/ (16605)
4 or/1-3 (97035)
5 Behavior Disorders/ (7732)
6 behavior problems/ (22059)
7 internalization/ or externalization/ (2948)
8 ((Child* or Adolesce*) adj4 internaliz*).mp. (2282)
9 ((Child* or Adolesce*) adj4 externaliz*).mp. (2444)
10 ((internaliz* or externaliz*) adj4 behavio*).mp. (4729)
11 anxiety disorders/ or anxiety/ (51755)
12 major depression/ (78709)
13 somatoform disorders/ (6717)
14 social isolation/ (5127)
15 attention deficit disorder with hyperactivity/ (11918)
16 conduct disorder/ (3150)
17 oppositional defiant disorder/ (1069)
18 hyperkinesis/ (7072)
19 Aggressive Behavior/ or Aggressiveness/ (22304)
20 conduct disorder/ (3150)
21 Conduct problem.tw. (343)
22 juvenile delinquency/ (13695)
23 Delinquent.tw. (8558)
24 or/5-23 (217949)
25 4 and 24 (10102)
26 limit 25 to (100 childhood <birth to age 12 yrs> or 160 preschool age <age 2 to 5 yrs> or 180 school age <age 6 to 12 yrs> or 200 adolescence <age 13 to 17 yrs>) (6429)
27 (child$ or adolescen$).tw. (597680)
28 25 and 27 (7819)
29 26 or 28 (8402)
30 limit 29 to (english or french) (7943)
31 limit 30 to yr="1978 -Current" (7594)

Database: EmbaseClassic+Embase<1947 to 2013 February 06>
Search Strategy:
---

1 exp parent/ (170260)
2 *family/ (24983)
3 caregiver/ (33078)
4 or/1-3 (222049)
5 behavior disorder/ (41322)
6 ((child$ or adolescen$) adj4 internali$).mp. (1418)
7 ((child$ or adolescen$) adj4 externali$).mp. (1443)
8 ((internali$ or externali$) adj4 behavio$).mp. (2902)
9 anxiety disorder/ or anxiety/ (144211)
10 depression/ (231211)
11 somatoform disorder/ (4428)
12 social isolation/ (15374)
13 attention deficit disorder/ (32641)
14 conduct disorder/ (3815)
15 behavior disorder/ (41322)
16 oppositional defiant disorder.mp. (2059)
17 hyperkinesia/ (4898)
18 aggression/ (40816)
19 conduct problem.mp. (206)
20 juvenile delinquency/ (7919)
21 delinquent.tw. (3312)
22 or/5-21 (443930)
23 4 and 22 (21876)
24 child/ (1356861)
25 adolescent/ (1229006)
26 (child$ or adolescen$).tw. (1380869)
27 24 or 25 or 26 (2548902)
28 23 and 27 (14459)
29 limit 28 to (english or french) (13460)
30 limit 29 to yr="1978 -Current" (11957) (11955 at the time of extraction)

Database: CINAHL
Search Strategy:

S27 S23 OR S25 (4,670)
S26 S23 OR S25 (4782)
S25 S22 AND S24 (3722)
S24 TI child* OR AB child* OR TI adolescen* OR AB adolescen* (187353)
S23 S4 AND S21 (4164)
S22 S4 AND S21 (7062)
S21 S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 (96962)
S20 TI delinquent OR AB delinquent (431)
S19 (MH "Juvenile Delinquency") (1197)
S18 conduct problem* (433)
S17 (MH "Aggression") (3500)
S16 (MH "Hyperkinesis") (131)
S15 "oppositional defiant disorder*" (192)
S14 (MH "Social Behavior Disorders+") (41337)
S13 (MH "Attention Deficit Hyperactivity Disorder") (5493)
S12 (MH "Social Isolation") (3377)
S11 (MH "Somatoform Disorders") (1393)
S10 (MH "Depression") (37798)
S9 (MH "Anxiety") (13071)
S8 Internali* N4 bahavio* OR externali* N4 behavio* (428)
S7 child* N4 externali* OR adolescen* N4 externali* (287)
S6 child* N4 internali* OR adolescen* N4 internali* (288)
S5 (MH "Child Behavior Disorders+") (3146)
S4 S1 OR S2 OR S3 (59641)
S3 (MH "Caregivers") (14543)
S2 (MM "Family") (9849)
S1 (MH "Parents+") (38543)

Database: SOCIOLOGICAL ABSTRACTS
Search Strategy:

S1 SU.EXACT.EXPLODE("Adolescent Fathers" OR "Adolescent Mothers" OR "Adolescent Parents" OR "Adoptive Parents" OR "Fathers" OR "Grandparents" OR "Homosexual Parents" OR "Mothers" OR "Parents" OR "Single Fathers" OR "Single Mothers" OR "Surrogate Parents" OR "Working Mothers") OR su.Exact("single parent families" OR "caregivers" OR "family" OR "single parent family") (32579)
S2 SU.EXACT.EXPLODE("Adopted Children" OR "Adult Children" OR "Children" OR "Foster Children" OR "Grandchildren" OR "Infants" OR "Only Children" OR "Premature Infants" OR "Preschool Children") OR SU.EXACT("Adolescents") OR ab((child* OR adolescen*)) OR all(adolescen*) (120849)
S3 SU.EXACT.EXPLODE("Behavior Problems") OR SU.EXACT("Internalization") OR SU.EXACT("External/Externalization/Externals") OR SU.EXACT("Depression (Psychology)") OR SU.EXACT("Social Isolation") OR SU.EXACT("Attention Deficit Disorder") OR SU.EXACT("Juvenile Delinquency") OR ab((delinquent OR conflict problem*)) OR ab((hyperkinesis OR oppositional defiant disorder*)) OR ab(somatoform disorder*) (21205)
S4 ab(child* NEAR/4 internali*) OR ab(adolescen* Near/4 internali*) OR ab(child* NEAR/4 externali*) OR ab(adolescen* NEAR/4 externali*) OR ab(internali* NEAR/4 behavio*) OR ab(externali* NEAR/4 behavio*) (1342)
S5 S3 OR S4 (22109)
S6 S1 AND S2 AND S5 (1600)
S7 (S1 AND S2 AND S5) AND la.exact("ENG" OR "FRE") (1565)
S8 (S1 AND S2 AND S5) AND (la.exact("ENG" OR "FRE") AND pd(19780101-20131231)) (1437)

APPENDIX C : DATA EXTRACTION ITEMS

Variable extracted	**Explanation**
	Groups and Sample Size
Number of groups	How many groups are included in the study?
Study group	Who is the study / intervention group? (Mothers or Fathers of which children)
Comparison group	Who is (are) the comparison group? (Mothers or Fathers of which children)
Dismissed groups	Which groups fall neither in the study group category or comparison group category?
Comparison group inclusion / exclusion criteria	Which criteria were used to define the healthy controls?
Sample size study group	The sample size of the study group
Sample size comparison group	The sample size of the comparison group
	Caregiver Demographic Variables
Caregiver education level study group	What is the caregiver's education level in the study group?
Caregiver education level comparison group	What is the caregiver's education level in the comparison group?
Caregiver SES study group	What is the caregiver's SES in the study group?
Caregiver SES comparison group	What is the caregiver's SES in the comparison group?
Caregiver ethnicity study group	What is the ethnic composition of the study group?
Caregiver ethnicity comparison group	What is the ethnic composition of the comparison group?
Study caregiver age	What is the age of the caregivers in the study group?
Comparison caregiver age	What is the age of the caregivers in the comparison group?
Study caregiver gender	What is the proportion of female caregivers in the study group?
Comparison caregiver gender	What is the proportion of female caregivers in the comparison group?
	Child Demographic Variables
Study child age mean	What is the age of the children in the study group?
Comparison child age mean	What is the age of the children in the comparison group?
Study child gender	What is the proportion of female children in the study group?

Comparison child gender	What is the proportion of female children in the comparison group?
	Subgroup and Comparison Information
Caregiver group decision	Which caregivers did the authors decide to target? Mothers only, fathers only, mothers and fathers, nonspecific)
Contrast – Ext.[1] Vs. Healthy	Binary variable indicating the contrast of the study. 1 = yes, 0 = no.
Contrast – Int.[2] Vs. Healthy	Binary variable indicating the contrast of the study. 1 = yes, 0 = no.
Contrast - Ext. Vs. Int.	Binary variable indicating the contrast of the study. 1 = yes, 0 = no.
	Outcome Measurement and Values
Caregiver outcome	On which variable were caregivers measured?
Measurement used	Which scale or measure was used to assess the caregiver outcome?
Type of measurement	Self-reported vs. Standardized questionnaire vs. Interview
Test used	Which statistical test was used in assessing differences?
Adjustment	What was adjusted for (if authors used adjustment in their analyses)?
Outcome mean (Study group)	What is the mean value of the caregivers on the chosen outcome?
Outcome mean (Comparison group)	What is the mean value of the caregivers on the chosen outcome?
Outcome mean (Dismissed group)	What is the mean value of the caregivers on the chosen outcome?
Outcome SD[3] (Study group)	What is the standard deviation of the caregivers on the chosen outcome?
Outcome SD (Comparison group)	What is the standard deviation of the caregivers on the chosen outcome?
Outcome SD (Dismissed group)	What is the standard deviation of the caregivers on the chosen outcome?
Value of test statistic	What is the value of the test used? (t-value, f-value, odds ratio, etc.)
	Post-Hoc Analyses and QA
Quality Assessment	Quality assessment score on a modified Downs and Black (1998) scale
Other	Any other general comments

[1] Parents of children with externalizing behaviour problems
[2] Parents of children with internalizing behaviour problems
[3] Standard deviation

APPENDIX D –QUALITY ASSESSMENT SCALE

(Custom items marked by asterisk*)

Reporting

1. Is the hypothesis/aim/objective of the study clearly described?
2. Are the main outcomes to be measured clearly described in the Introduction or Methods section?*
3. Are the characteristics of the patients *(Caregivers)* included in the study clearly described? *(4 of 5 demographic variables described)**
4. How clear are the definitions of caregivers with 'healthy' versus 'sick' children? *(Same number of demographic variables for each)**
5. Are the exposures *(Children with BP)* well defined? *(Age and gender)**
6. Are the main findings of the study clearly described?
7. Does the study provide estimates of the random variability in the data for the main outcomes?
8. Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001? *(ALL probability values need to be reported. Probabilities above .05 that are only marked as N.S get "0" for this question).*

Exposure definition

1. How is child condition reported (Parent report, clinical diagnosis, taken from database)? *
    - Diagnosis = 2 points
    - Self-reported or parent reported = 1 point
    - Unclear = 0 points

Outcome Assessment

1. Are the outcomes measured "firmly" or "softly".*
    - Diagnosis = 2 points
    - Self-reported or parent reported = 1 point
    - Unclear = 0 points

External validity

1. Were those subjects who were prepared to participate representative of the entire population from which they were recruited?

Internal validity – bias

1. If any of the results of the study were based on "data dredging", was this made clear?
2. Were the statistical tests used to assess the main outcomes appropriate?

Internal validity - Confounding

1. Did authors use matching to minimize the effects of confounding? *
2. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn? *(Adequate adjustment = any adjustment except for matching)**

Note : If p-values were * in tables, but available in text, I put a "1". If p-values were * in tables, and the text only seemed to indicate <.37, <.5, <.82, and did not seem to have all p-values, I put a "0". Furthermore, any sort of values indicating <.04, <.20, <.006 have been rejected, as they are not ACTUAL p-values.

APPENDIX E - STUDY CHARACTERISTICS

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Anderson (1994)[78], Article	US, 69.8% Caucasian, 9.3% African-American, 8.1% Latino, 9.3% Asian, and 3.5% Native American. (whole population)	ADHD[1]	Children are combined from assessment and summer school phases of two university studies for ADHD. ADHD children clinically referred to the study. Control through newspaper ads.	49 (ADHD), 37 (Control)	Children were screened for DBD. No indication of comorbidities.	40.2 (whole population), 100% Mothers	9.6 (whole population), 100%	N/A	"Families were primarily middle and upper-middle class"	N/A
Aspy (1994)[124], Thesis	US, N/A	ADHD[2]	ADHD recruited through university based psychoeducation clinic, a pediatric medical clinic, and local ADHD support group. Control group residents of north central TX.	36 (ADHD), 36 (Control)	2 control children had reading difficulties. One child had a Ritalin prescription.	N/A, 100% Mothers	6-12 y.o age range (both groups), 100% (both groups)	100% High school or above (Both groups)	14 >$50000 (ADHD), 13 >$50000 (Control) (Full data available in data extraction sheet)	88.88% Intact couples (ADHD), 80.55% Intact Couples (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Avery (2001)[125], Thesis	US, 93% Caucasian, 7% African American (whole population)	ADHD, ODD/CD[2]	Children recruited through parent-teach groups, learning centres, parent-support organizations, sporting and recreational activities. Correspondance by person, mail, e-mail, or phone.	46 (ADHD), 42 (ODD/CD), 40 (Control)	ODD children may also have a LD or ADHD. No indication of comorbidities in control group.	39.96 (ADHD), 40.69 (ODD/CD), 40.43 (Control), 82.56% Mothers (Whole Population)	11.07 / 71% (ADHD), 10.74 / 78.57% (ODD/CD), 11 / 62.5% (Control)	98.3% High school and above (Whole population)	69% employed full time, 14% employed part time, 17% unemployed (whole population)	83.7% Married (First marriage + remarried combined) (Whole population)
Baker (1995)[126], Article	US, 88% "White" (ADHD), 94% "White" (Control)	ADHD 1	ADHD recruited from university based parent training program for children with ADHD. Control group mothers recruited from Ψ undergrad courses	16 (ADHD), 16 (Control)	Scored in non-clinical CBCL. No indications of comorbidities.	38.75 / 100% Mothers (ADHD), 33.75 / 100% Mothers (Control)	8.81 / 81.25% (ADHD), 8.81 / 68.75% (Control)	15.50 (ADHD), 14.18 (Control)	46.5 (Hollingshead four factor) (ADHD), 44.37 (Control)	81% lived with "natural" parents (ADHD), 38% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Barkley (1992)[127], Article	US / +-100% Caucasian	ADHD without ODD, and ADHD with ODD[1]	Study group came from clinic referrals, Control group from newspaper ads and medical centre ads.	27 (ADHD), 56 (ADHD/ODD), 77 (Control)	16 of the children were learning disabled	41.6 / 100% Mothers (ADHD), 39.8 / 100% Mothers (ADHD/ODD), 41.1 / 100% Mothers (Control)	Between 13.9 and 14.4 years old (Whole Population), 88.9% (ADHD), 91.2% (ADHD/ODD), 81.82% (Control)	14.2 (ADHD), 13.5 (ADHD/ODD), 14.4 (Control)	45.6 (ADHD), 45.8 (ADHD/ODD), 52.6 (Control)	77% Of the mothers were married to the biological fathers
Baumann (2000)[128], Thesis	US, 68.6% Caucasian, 23.5% African American, 11.8% Other (ADHD), 62.3% Caucasian, 34.8% African American, 1.4% Hispanic, 1.4% Other (ADHD/ODD), 65%	ADHD, ADHD/ODD[2]	Recruited through university based clinic, flyers, and newspaper ads (ADHD). Control children recruited from same schools or neighbourhoods as ADHD children.	52 (ADHD), 69 (ADHD/ODD), 120 (Control)	No mention of any conditions in Control group.	33.4 / 100% Mothers (ADHD), 32.5 / 100% Mothers (ADHD/ODD), 34.5 / 100% Mothers (Control)	5.1 / 76.9% (ADHD), 5.3 / 85.5% (ADHD/ODD), 5.2 / 81.7% (Control)	N/A	$41451 (ADHD), $39673 (ADHD/ODD), $49254 (Control) (mean income)	Children had to live with biological mother, no word on marital status.

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
	Caucasian, 30% African American, 5% Other (Control)									
Befera (1985)[129], Article	US, N/A	Boys with hyperactiv-ity, Girls with hyperactiv-ity[1]	Referrals to a child psychology clinic. Control children friends of the study group.	30 (Hyperactive), 30 (Control)	Scores on Hyperactivity scale fell within 1.5 SD's. No word on concurrent conditions.	34.9 / 100% Mothers (Hyperactive), 34.6 / 100% Mothers (Control)	8.475 / 100% (Boys), 8.758 / 0% (Girls) (Hyper), 8.55 / 100% (Boys), 8.55 / 0% (Girls) (Control)	N/A	3.1 (Hyperactive), 2.5 (Control) (Using Hollingshead two-factor Index of Social Position)	N/A

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Breen (1988)[130], Article	US, N/A	Girls with ADHD, Boys with ADHD[1]	Children referred to a pediatric psychology clinic (ADHD). Friends of clinic children (Control)	13 (boys), 13 (girls), 13 (control)	Scores within 1.5 SD's of hyperactivity. No mention of comorbidities.	36.3 / 100% Mothers (boys), 33.5 / 100% Mothers (girls), 38.1 / 100% Mothers (control)	8.9 / 100% (Boys); 9.2 / 0% (Girls), 9.44 / 0% (Control)	13.5 years (Boys), 13.7 (Girls), 15.3 (Control) (Years of education)	N/A	Study mentions parents a lot, could indicate intact couples. No further information.
Brown (1988)[131], Article	US, 74% White, 16% Black, 10% Hispanic (Whole study)	ADD[2]	Through referral, suggesting medical setting. Control children matched with referred children.	58 (ADD), 58 (Control)	Children with Learning Disabilities (LD) or with a DSM-3 diagnosis were screened out of the control group	N/A	8.98 / 81% (ADD), 9.49 / 82.76% (Control)	N/A	N/A	75.86% Married (ADD), 98.28% Married (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Brown (1989)[132], Article	US, 74% White, 16% Black, 10% Hispanic (Whole study)	ADHD 1	Referrals to a university diagnostic learning clinic for children. Control children matched and from nearby schools	51 (ADHD), 34 (Control)	Children with Learning Disabilities (LD) or with a DSM-3 diagnosis were screened out of the control group	50 Mothers 38 Fathers (ADHD), 33 mothers 31 fathers (Control) (Age not available for either group)	8.98 / 100% (ADHD), 9.49 / 100% (Control)	N/A	Typically fall in the middle, no concrete statistics.	78.43% Married (ADHD), 94.11% Married (Control)
Campbell (1991)[133], Article	US, N/A	Parent-Identified (P-I) and Teacher identified (T-I) overactive / impulsive problems[2]	Questionnaires sent to 726 attenting one of 16 preschools (T-I), from local clinics and pediatrician offices, as well as letters (P-I). Classroom controls.	28 (P-I), 42 (T-I), 43 (Control)	Children who did not meet cutoff in behavioural criterias. No indication of comorbidity.	32.74 / 100% Mothers (P-I), 33.55 / 100% Mothers (T-I), 33.49 / 100% Mothers (Control)	3.56 / 100% (P-I), 3.93 / 100% (T-I), 3.96 / 100% (Control)	N/A	46.59 (P-I), 52.40 (T-I), 54.21 (Control) (Hollingshead scores)	Living with partner: 88.88% (P-I), 80.95% (T-I), 93% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Chronis (2003)[134], Article	US, ADHD+ODD (64.7% White, 30.9% African-american), ADHD (60.7% White, 25% African-American), Control 62.9% White, 31% African-American.	ADHD+ODD, ADHD[1]	Recruited through referrals (for inattention / hyperactivity) at University child psychiatry clinics, schools, and newspaper ads. Controls recruited from same school and neighbourhood.	68 (ADHD/ODD), 30 (ADHD), 116 (Control)	Were never referred to mental health services. No indication of comorbidity.	N/A, 100% Mothers	5.3 / 83.8% (ADHD+ODD), 5.07 / 76.7% (ADHD), 5.18 / 79.3% (Control)	13.85(ADHD+ODD), 14(ADHD), 14.46 (Control) (Years of education)	$37809 (ADHD+ODD), $47286 (ADHD), $47911 (Control) (Income)	N/A
Compas (1991)[135], Article	US, Sample: 98% of the families were "white"	Externalizing, Internalizing[2]	Sent recruitment letter to all 6th, 7th, and 8th grade students in eight schools in rural Vermont.	24 (externalizing), 25 (internalizing), 94 (control)	Non indication of comorbidities (normal CBCL)	N/A, N/A	12 years old (Whole population), 54.16% Male (Ext), 44% Male (Int), 39% Male (control)	13.18 (mothers), 12.72 (fathers) (whole pop.) (Years of education)	Median income between $20000-$24999 (whole pop.)	82% Two-parent families

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Costas (1995)[136], Thesis	US, 93.3% Caucasian, 6.7% African American, 0% Hispanic (ADHD), 96.7% Caucasian, 0% African American, 3.3% Hispanic (Control)	ADHD 1	ADHD children recruited through referrals from parent training groups at ADHD clinic, support groups, and schools. Control children recruited through public schools	30 (ADHD), 30 (Control)	School counselor reported no Learning Disability (LD), Behaviour Problem (BP), or Psychological (Ψ) problems. No indications of comorbiditi es	37.2 / 100% Mothers (ADHD), 36.7 / 100% Mothers (Control)	9.13 / 100% (ADHD), 8.93 / 100% (Control)	N/A	44.99 (ADHD), 48.55 (Control) (Hollingshead)	70% Married (ADHD), 90% Married (Control)
Cunningham (1988)[137], Article	Canada, N/A	ADDH 1	Recruited through family physicians and child psychiatrists. Controls through community organizations.	26 (ADDH), 26 (Control)	No more than 1SD above hyperactivity measure. No indication of cmby.	100% Mothers and Fathers (Age not available)	9.83 (ADDH), 10 (Control), 92.3% for the whole population	N/A	3.3 (ADDH), 3.4 (Control) (Hollingshead)	All 2 parent families

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Cunningham (2002)[138], Article	Canada, N/A	ADHD, ODD, ADHD+ODD[2]	Questionnaires sent to parents of kindergarten children.	24 (ADHD), 18 (ODD), 52 (ADHD/ODD), 35 (Control)	Below 1.5 SD's on Home Situations Questionnaire (HSQ). No indication of comorbidity	100% Mothers (Age not available)	4.783 / 45.8% (ADHD), 4.775 / 38.9% (ODD), 4.775 / 51.9% (ADHD/ODD), 4.8 / 44.1% (Control)	5.0 (ADHD), 5.5 (ODD), 5.6 (ADHD+ODD), 6.0(Control) (Own scale where 5 = High School and 6 = Some Community College)	4.7 (ADHD), 4.4 (ODD), 4.9 (ADHD+ODD), 5.6 (Control) (Income Level)	70.8% (in couple) (ADHD), 88.2% (ODD), 78.4% (ADHD/ODD), 78.8% (Control)
Derisley (2005)[155], Article	UK, N/A	Children with Anxiety[1]	The clinical groups were recruited from two Child and Adolescent Mental Health Services. Control group recruited randomly through school in England	28 (Anxiety), 62 (Control)	No indication of comorbidities	78.57% Mothers (Anxiety), 96.77% Mothers (Control) (No significant age differences between groups)	14.6 (whole population) (Between 11- 18) (Gender not available)	N/A	N/A	N/A

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Gau (2007)[50], Article	Taiwan, N/A	ADHD 1	ADHD recruited through psychiatry clinic and ADHD Education Foundation in Taiwan. Control children recruited from 12 school districts in Taipei.	375 (ADHD), 750 (Control)	No indication of comorbidities	40.2 / 100% Mothers (ADHD), 39.2 / 100% Mothers (Control)	10.7 / 87.73% (ADHD), 10.6 / 87.73% (Control)	87.9% Senior high and above (ADHD), 79.5% Senior high and above (Control)	N/A	N/A
Hellier (1991)[139], Thesis	US, 88.2% Caucasian, 11.8% A-A (Externalizing), 86.7% Caucasian, 13.3% A-A (Control)	Externalizing [2]	Recruited through Maryland public schools, private pediatric clinic, and Washington Post Health Section.	17 (Ext), 15 (Control)	CBCL score at 62 or below. No indication of comorbidities	39.33 / 100% Fathers (Externalizing), 38.76 / 100% Fathers (Control)	8.23 / 100% (Ext), 7.8 / 100% (Control)	Both groups had 100% High school or above	1.76 (Ext), 0.85 (Control)	100% Intact couples (first marriage)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Kaslow (1988)[156], Article	US, 10 White, 3 Black, 2 Others (Depressed), 19 White, 2 Black, 4 Others (Control)	Children with Depression[1]	Clinical children was families who had recently begun treatment. Control children were recruited through newspaper ads.	15 (Depressed), 25 (Control)	No indication of comorbidities	33.7(Mothers), 34.9(Fathers) (Depressed), 35.8(Mothers), 39.4(Fathers) (Control)	9.9 / 80% (Depressed), 10 / 48% (Control)	12.6 (Mothers), 12.8 (Fathers) (Depressed), 14.0 (Mothers), 14.8 (Fathers) (Control) (Years of education)	8/15 had income <$20000 (Depressed), 4/25 had income <$20000 (Control)	5/15 Married (Mothers), 6/15 (Fathers) (Depressed), 13/25 (Mothers), 15/25 (Fathers) (Control)
Lach (2009)[21], Article	Canada, Born in Canada: 96.70% (Ext grp), 94.46% (Control)	Externalizing[2]	Representative Canadian population data	1067 (ext), 7236 (Control)	No known comorbidities	35.12 / 89.8% Mothers (Ext), 36 / 89.53% Mothers (Control)	7.51 / 51.78% (Ext), 7.38 / 49.66% (Control)	79.89% (High school or above) (Ext), 84.94% (Control)	$48978 (Mean household income) (Ext), $53223(Control)	76.13% Married (Ext), 84.46% (Control)
Lee (2008)[52], Article	Korea, N/A	ADHD 1	Recruited outpatiens of a hospital. Control group recruited through ads.	50 (ADHD), 59 (control)	Control had nopsychiatric history, no current psychiatric symptoms and no current behavioral issues.	38.1 / 100% Mothers (ADHD), 38.1 / 100% Mothers (Control)	8.5 / 74% (ADHD), 8.1 / Unclear (Control)	13.5 (ADHD), 13.6 (Control) (Years of education)	N/A	N/A

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Lee (2010)[140], Article	Taiwan, N/A	Children with Oppositional Defiant Disorder (ODD)[2]	Half of the classes between grade 1 and 6 were randomly selected at an elementary school	58 (OD), 324 (Control)	No indication of comorbidities	39.06 / 100% Mothers (ODD), 39.10 / 100% Mothers (Control)	10.03 / 70.18% (OD), 10.03 / 47.22% (Control)	56.90% College of above (ODD), 45.79% College or above (Control)	90.57% Full-time job (Fathers), 60.34% (Mothers) (ODD), 91.69% Full-time job (Fathers), 64.58% (Mothers) (Control)	89.09% Two-parent families (ODD), 93.33 % Two-parent families (Control)
Manor-Binyamini (2012)[141], Article	Israel, N/A	Conduct Disorder[3]	CD children recruited from special education schools (Unclear as to what they are exactly). Control children recruited from "regular" schools.	300 (CD), 100 (Control)	No indications of comorbidities	Age groups (n): 20–29 (25), 30–39 (40), 40–49 (27), 50–59 (8) (CD); 20–29 (27), 30–39 (41), 40–49 (26), 50–59 (6) (Control) (100% Mothers and Fathers for both groups)	Age groups (n): 6 (14), 7–13 (59), 14–18 (28) / 89% (CD); No control data available	97% Secondary or above (CD), 98% (Control)	83% has work as an income source (CD), 86% (Control)	66% Married (CD), 75% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Murphy (1996)[142], Article	US, 100% Caucasian	ADHD, Mild ADHD[1]	Parents were contacted by telephone (How?) and asked to participate. Control children recruited through newspaper ads and through asking participants or earlier studies to take part.	25 (ADHD), 25 (ADHD-M), 25 (Control)	CBCL <65. No indication of comorbidities	39.36 / 93.7% Mothers (ADHD), 41.60 / 68% Mothers (ADHD-M), 42.92 / 68% Mothers (Control)	15.4 / 94% (ADHD), 14.9 / 94% (ADHD-M), 14.6 / 94% (Control)	13 (ADHD), 14.28 (ADHD-mild), 15.4 (Control) (Year of education)	57.20 (ADHD), 64.80 (ADHD-M) , 71.6 (Control) (Hollingshead)	N/A
Neff (2008)[118], Thesis	US / Canada, N/A	ADHD[2]	Population data based on two national surveys ; NHIS (US), NLSCY (Can)	110 (Canada), 181 (US) (ADHD), 3919 (Canada), 2819 (US) (Control)	No indication of comorbidities	38.02 / 100% Mothers (Canada), 47.02 / 100% Mothers (US) (ADHD), 38.49 / 100% Mothers (Canada), 45.99 / 100% Mothers (US)	8-11 years old / N/A (All groups)	N/A	N/A	61% Married (ADHD), 71% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
						(Control)				
Neff (2010)[119], Article	US, 55% Non hispanic white (ADHD), 60% (Control)	ADHD[1]	Population data using the National Health Interview Survey	145 (ADHD), 2635 (Control)	No indication of comorbidities	44.03 / 100% Fathers (ADHD), 46.02 / 100% Fathers (Control)	8-11 years old / "Nationally representative" (All groups)	10.46 (ADHD), 11.58 (Control) (Years of education)	Data said to be "Nationally representative "(whole pop.)	45% Married (ADHD), 43% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Nigg (1998)[143], Article	US, 62.7% White, 14.1% African American, 8.5% Latino, and 14.8% Asian American (whole population)	ADHD +ODD /CD, ADHD[1]	"ADHD participants were recruited from area clinics, schools, physicians, and self-help groups." "Comparison boys without ADHD were recruited from the community through newspaper advertisements and recruitment announcements at area schools".	49 (ADHD + ODD), 31 (ADHD), 62 (Control)	3 children diagnosed with ODD were included in the control group to "...avoid an artificially healthy comparison group"	40.0 (Mother, ADHD+ODD), 42.6 (Father, ADHD+ODD), 41.4 (Mother, ADHD), 42.8 (Father, ADHD), 39.3 (Mother, Control), 40.8 (Father, Control) / 132 mothers and 69 fathers provided data (Whole population)	9.2 / 100% (ADHD+ODD), 9.3 / 100% (ADHD), 9.0 / 100% (Control)	N/A	48 (ADHD+ODD), 51.1 (ADHD) , 49.4 (Control) (Hollingshead)	N/A

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Petrauskas (2008)[77], Thesis	Canada, 87.5% Caucasian, 12.5% Other (ADHD), 77.8% Caucasian, 11.1% Other, 5.6% African descent, 5.6% Asian (Control)	ADHD 2	All children recruited from private preschools, daycares, listservs, flyers posted in public areas and mall recruitment.	5 (ADHD), 13 (Control)	No indications of comorbidities	37.83 / 100% Fathers (ADHD), 35.06 / 100% Fathers (Control)	3.92 (ADHD), 4.14 (Control) / Study reports that out of 26 children, it was 50% male and 50% female. Further subdivision makes it unclear	No significant differences between parents on education level	53.18 (ADHD), 47.3 (Control) (Socio economic prestige)	N/A
Pimentel (2011)[48], Article	Portugal, N/A	ADHD [1]	ADHD from Child Development Centre in pediatric hospital. Control from scale's adaptation samples (translation to Portuguese)	52 (ADHD), 600 (Control)	Control group came from adaptation population (scale translation). No effort made to consider healthy. General population data.	36.88 / 100% Mothers (ADHD), N/A / 100% Mothers (Control)	9.01 / 76.9% (ADHD), N/A / N/A (Control)	30.8% Secondary school and above (ADHD), N/A (Control)	SES Category (n): Low (9) (17.3%), Medium low (22) (42.3%), Medium (16) (30.8%), Medium high (5) (9.6%) (ADHD), N/A (Control)	75% Married (ADHD), N/A (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Podolski (2001)[144], Article	US, 85.7% Caucasian (ADD), 88% Caucasian (ADHD-C), 75% Caucasian (Control)	ADD, ADHD - Combined[2]	Parents recruited through mailing to all local school districts and parent support groups. Invitation also to parents of children being treated. Control recruited also through flyers at pediatric hospital.	15 (ADD), 22 (ADHD-C), 22 (Control)	No indications of comorbidities	53.5% Mothers (ADD), 57.8% Mothers (ADHD-C), 55% Mothers (Control) (Age not available)	10.6 / 56% (ADD), 9.2 / 70% (ADHD-C), 10.2 / 67% (Control)	N/A	49.3 (ADD), 34.0 (ADHD-C), 43.0 (Control) (Revised Duncan SES scale)	N/A
Salamone (1994)[145], Thesis	US, N/A	ADHD 1	ADHD recruited through area hospital based outpatient psychiatry clinic. Control through local school district	25 (ADHD), 25 (Control)	No indication of comorbidities	37.48 / 100% Mothers (ADHD), 37.44 / 100% Mothers (Control)	8.04 / 100% (ADHD), 8.56 / 100% (Control)	N/A	Matched with control: income. Ranged from low-midtoupp-mid.	Single parent families were excluded. 100% of sample were intact couples.
Satake (2004)[146], Article	Japan, 100% Japanese	ADHD, ADHD + ODD/CD[1]	Study children referred from outpatient child psychiatry clinic at university. Control children recruited from	12 (ADHD), 15 (ADHD+ODD/CD), 14 (Control)	No DBD, anxiety, or mood disorders. No indication of comorbidities	N/A	8.3 / 83.3% (ADHD), 7.7 / 86.7% (ADHD+ODD), 8.9 / 92.9% (Control)	N/A	58% in manual labour jobs (ADHD), 80% (ADHD+), 29% (Control)	75% intact couples (ADHD), 80% (ADHD+ODD), 93% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
			public primary schools.							
Simsek (2012)[51], Article	Turkey, N/A	ADHD [1]	ADHD children admitted to outpatient clinic of a medical school. Control group was "society-based" and found by friends and family of the medical staff	34 (ADHD), 34 (Control)	ADHD and ODCD diagnoses screened for. No indication of comorbidities	35.3 (Mother), 39.1 (Father) (ADHD), 35.5 (Mother), 39.4 (Father) (Control)	Between 6 and 17 (Whole population)	9.2 (Mother), 10.3 (Father) (ADHD), 9.7 (Mother), 10.7 (Father) (Control) (Years of education)	N/A	N/A
Solem (2011)[49], Article	Norway, N/A	Externalizing [1]	Clinic referred children recruited from 7 psychiatric units from Oslo and surrounding counties. Control recruited from 12 schools in same area as clinics	64 (Ext), 128 (Control)	2 children had ADHD, but mild enough NOT to be referred to clinical unit.	39.33 (Ext), 40.16 (Control) (Gender not available)	9.67 / 100% (Ext), 10.02 / 100% (Control)	13.42 (Ext), 15.1 (Control) (Years of education)	N/A	53% married / cohabiting (Ext), 76% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Strahm (2008)[147], Thesis	US, 100% Caucasian	ADHD[1]	ADHD children were referrals from health care professionals, parent support groups. Control children referred by colleagues. Both also through ads	11 (ADHD), 12 (Control)	Children with disability screened for. No indication of comorbidities	35.3 (Mothers), (ADHD), 41.6 (Mothers) (Control), 40.8 (fathers, whole population)	9.1 (whole population) / 90.9% (ADHD), 50% (Control)	100% High school or above (ADHD), 100% High school or above (Control)	36% Full-Time (Mothers), 100% Fathers (ADHD), 45% (M), 90% (F), (Control)	100% intact couples
Tan (2005)[157], Article	Malaysia, Malay (75.5%), Chinese (15.1%), Indian (9.4%) (Depressed), Rates similar in Control (No data)	Depression[1]	All children recruited from child outpatient clinic of national university of Malaysia. Control children may be recruited from general medical centre.	53 (Depressed), 53 (Nondepressed)	Control children recruited at the same centre, may have comorbidities. No data to support hypothesis.	46 Mothers, 36 Fathers (Depressed), 35 Mothers, 24 Fathers (Control) (Age not available)	12.4 (Depressed), 12.4 (Nondepressed) (Gender not available)	Mothers and fathers of both groups did not differ in education. Mothers typically had a sec. education	Mothers and fathers did not differ in terms of occp. Mothers were typically housewives	N/A
Tang (2008)[148], Thesis	US, 87.5% Caucasian, 3.4% hispanic, 5.7% African American, 1.1% Asian,	ADHD[1]	Letters sent to elementary and middle schools, ADHD support groups, and intermediate school districts. Referrals from University study,	20 (ADHD), 20 (Control)	No indications of comorbidities	40.04 / 76.9% Mothers (ADHD), 39.41 / 70.37% Mothers (Control)	9.55 / 85% (ADHD), 8.91 / 35% (Control)	70.4% (population) obtained a graduate or professionnal degree or higher)	42.3% $45000-$69999 (ADHD), 40% >$100000 (Control)	85% (population) married

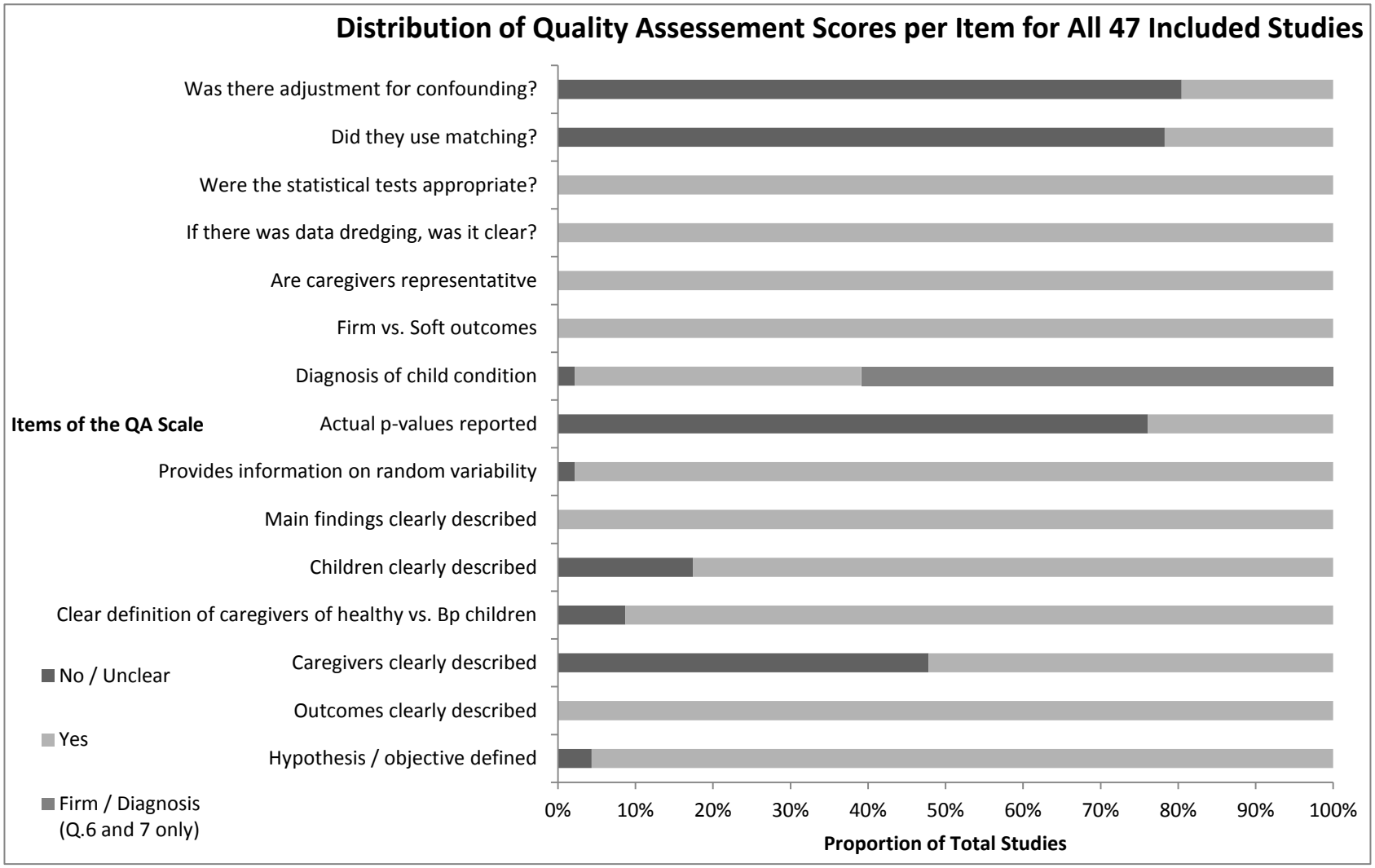
Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
	2.3% Other (study population)		snowballing method.							
Timmis (1990)[149], Thesis	US, 88.46% Caucasian, 7.69% Black, 3.84% Other (ADHD), 38.46% Caucasian, 57.69% Black, 3.84% Other (Control)	ADHD[1]	ADHD children were referred to the Children's Hospital of Michigan (CHM) or division of Ψ. Control was recruited from school program and kindergarten, daycare, and CHM staff child	26 (ADHD), 26 (Control)	No indication of comorbidities	31.4 / 100% Mothers (ADHD), 32.6 / 100% Mothers (Control)	4.75 / 65.38% (ADHD), 4.68 / 53.85% (Control)	N/A	40.35 (ADHD), 42.9 (Control) (Hollingshead 4-factor)	57.69% Married (ADHD), 57.69% Married (Control)
Tischer (1994)[158], Article	Australia, N/A	Depression[2]	Children recruited through all families coming to hospital with children 7-11 for outpatient treatment.	20 (Depressed), 88 (Control)	All children recruited from hospital, there may be comorbidities (No data to support)	19 Mothers, 10 Fathers (Depressed), 52 Mothers, 41 Fathers (Control) ("Groups did not	22.7% were 8, 15.3% were 10 (whole population), no data in between / 71.8% Male	N/A	49.1 % unskilled, 35.6% skilled, 15.3% professional, (Whole population)	73% intact families (Whole population)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
						differ" on age)	(Whole population)			
Triantafyllou (2012)[150], Article	(UK) Greece, Externalizing : 95.8% Greek, 0% English, 4.2% Albanian, Internalizing : 96% Greek, 4% English, 0% Albanian, Control : 100% Greek	Externalizing, Internalizing[1]	Recruited from medical / pedagogical centres in Athens. Control group recruited from two high schools.	24 (Ext), 25 (Int), 28 (Control)	No indication of comorbidity	44.7 / 100% Mothers (Ext), 43.4 / 100% Mothers (Int), 43.2 / 100% Mothers (Control)	13.9 / 75% (Ext), 13.3 / 44% (Int), 13.6 / 53.6% (Control)	N/A	N/A	91.7% Married (Ext), 72% (Int), 82.2% (Control)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Tsagarakis (1999)[151], Thesis	Canada, 100% Caucasian (Externalizing), 87.5% Caucasian (Internalizing), 88.24% Caucasian (Control)	Externalizing, Internalizing[2]	Clinical children drawn from a pool of referrals from two mental health (Ψ) community agencies. Control children are school-aged, recruited from parents taking a Ψ class.	18 (ext), 16 (Int), 17 (Control)	CBCL below 60. No indication of comorbidities.	34.33 / 100% (Externalizing), 33.38 / 100% (Internalizing), 32.91 / 100% (Control)	8.39 / 88.88% (Externalizing), 9.01 / 87.5% (Internalizing), 7.71 / 47.05% (Control)	61.1% Higher than high school (Ext), 75% (Int), 100% (Control)	Number of individuals classified on Hollingshead 4 factor from lowest to highest: 0, 5, 5, 4, 4 (Ext); 0, 1, 7, 5, 3(Int); 0, 7, 6, 4 , 0 (Control) (Hollingshead 4-factor)	Married: 66.7% (Ext) 25% (Int), 35.3% (Control). Living together: 0% (Ext) 12.5% (Int), 11.8% (Control)
Walker (1999)[159], Thesis	US, 49.4% Caucasian, 38.3% African American, 12.3% Hispanic (Whole population)	ADHD, Depression[1]	Recruited through outpatient mental health agency (Whole population)	57 (ADHD), 24 (Depression)	No indication of comorbidities	32.35 / 100% Mothers (Whole population)	8.8 / 72.8% (Whole population)	14.8% College, 34.6% Some college, 44.4% at least some high school, 6.2% no high school (Whole pop.)	$0-$10000 (34%), $10001-$20000 (44.3%), >$20001 (21.5%), 8 subjects = $0 (Whole population)	34.2% Married to the child's father (Whole pop.)

Author (year) / Article or Thesis	Country / Ethnicity	BP*	Sample Source (Clinic vs. Pop.)	Sample Size	Comorbidities in Control group	Caregiver Age and Gender	Child Age and Gender (% Male)	Caregiver Education	Caregiver SES	Marital Status
Whalen (2006)[152], Article	US, N/A	ADHD[1]	Recruited through flyers in local public school, e-mail, and community physicians	27 (ADHD), 25 (Control)	No known BP or LD. No indication of comorbidities.	42.67 / 100% Mothers (ADHD), 42.05 / 100% Mothers (Control)	10.58 / 66.66% (ADHD), 10.87 / 60% (Control)	69% BA or higher (whole population)	"Middle-income" sample	No significant group differences in marital status
Young (1991)[153], Thesis	US, "Caucasian"	Pervasive Hyperacti-ve (P-H) ; Situational Hyperacti-ve (S-H)[2]	Archival data collected at large midwestern's children hospital. Through newspaper ads	12 (P-H), 12 (S-H), 12 (Control)	Score of <15 on diagnostic scale. No indications of comorbidities	100% Mothers (Age not available)	7.46 / 100% (P-H); 7.95 / 100% (S-H), 7.93 / 100% (Control)	12.67 (P-H), 13.33(S-H), 14.67 (Control) (Years of education)	38.89 (P-H), 41.00 (S-H), 48.67 (Control) (Hollingshead)	Unclear
Yuen (2009)[154], Thesis	US, 33% Polynesian, 33% Japanese, 33% Anglo American (Whole population)	ADHD[1]	ADHD from health clinics involved with diagnoses for public schools. Control from public schools	90 (ADHD), 30 (Control)	No indications of comorbidities	36.20 (Mothers), 37.94 (Fathers) (ADHD), 36.83 (Mothers), 39.43 (Fathers) (Control)	10.58 / 68.9% (ADHD), N/A / N/A (Control)	High school and above : 97.8% (Mothers), 95.5% (fathers) (ADHD), 100% (Mothers), 96.7% (fathers) (Control)	$30000-$39000 (26) (Mother)$40000-$49000 (33) (Father) (ADHD),$30000-$39000 (8) (Mother), >$50000 (9) (Father) (Control)	N/A

APPENDIX F - QUALITY ASSESSMENT ITEM SCORE DISTRIBUTION



APPENDIX G – INCLUDED STUDIES' REPORTED OUTCOMES

Author (year)	Depression	Psychiatric Symptoms	Parental Stress	QOL	Daily Hassles	Burden	Anxiety	Well-Being	Distress
Anderson (1994)		x							
Aspy (1994)			x						
Avery (2001)								x	
Baker (1995)			x						
Barkley (1992)	x						x		
Baumann (2000)	x				x				
Befera (1985)	x								
Breen (1988)	x		x						
Brown (1988)	x								
Brown (1989)	x								
Campbell (1991)	x								
Chronis (2003)	x								
Compas (1991)							x		
Costas (1995)		x							
Cunningham (1988)	x								
Cunningham (2002)	x								
Derisley (2005)		x							
Gau (2007)		x							

Author (year)	Depression	Psychiatric Symptoms	Parental Stress	QOL	Daily Hassles	Burden	Anxiety	Well-Being	Distress
Hellier (1991)		x							
Kaslow (1988)	x								
Lach (2009)	x								
Lee (2008)	x								
Lee (2010)				x					
Manor-Binyamini (2012)						x			
Murphy (1996)		x							
Neff (2008)								x	
Neff (2010)								x	
Nigg (1998)	x						x		
Petrauskas (2008)			x						
Pimentel (2011)			x						
Podolski (2001)			x						x
Salamone (1994)		x							
Satake (2004)		x							
Simsek (2012)		x							
Solem (2011)			x						
Strahm (2008)			x						
Tan (2005)	x		x						
Tang (2008)	x						x	x	
Timmis			x						

Author (year)	Depression	Psychiatric Symptoms	Parental Stress	QOL	Daily Hassles	Burden	Anxiety	Well-Being	Distress
(1990)									
Tischer (1994)	x								
Triantafyllou (2012)	x						x		
Tsagarakis (1999)		x	x						
Walker (1999)			x						
Whalen (2006)		x							
Young (1991)			x						
Yuen (2009)			x						