

Behaviour Problems in Children with Asthma  
and their Siblings

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Stephanie J. Beynon

University of Canterbury, New Zealand

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## ABSTRACT

The aim of this study was to examine the relationship between asthma and behaviour, between children with asthma (mean age= 6.11), and their siblings without asthma (mean age= 6.03). Maternal reports of children's behaviour with asthma (N=10) and their siblings without asthma (N=10) were measured using the *Strengths and Difficulties Questionnaire*. Additional questions on asthma severity and general health were also included. Using a Chi-square method for matched pairs, the findings indicated that children with asthma did not have more behaviour problems than their siblings who did not have asthma. However, children with asthma were more likely to have tantrums and problems with attention than were their siblings without asthma. The total behaviour score indicated that for seven of the sibling pairs their behaviour was similar, in that there were no problems. Additionally, children who had asthma and took preventer medication were less likely to have behaviour problems than children who did not use asthma preventers. This study was limited by the small sample size and the reliance on maternal reported measure of behaviour. Important factors that might affect behaviour in children with asthma and their siblings were identified, and directions for future research and clinical practice have been proposed.

## CHAPTER 1

### INTRODUCTION

Asthma is an inflammatory disorder of the airways, which causes restriction of airflow to and from the lungs. Asthma is typically characterised by recurring episodes of wheezing, breathlessness, chest tightness and wheezing. Asthma attacks are episodic but inflammation of the airway is chronically present (Asthma & Respiratory Foundation, 2007). For many children and adults, medication must be taken daily to control symptoms, improve lung function and prevent attacks. Some medications are also required to relieve acute symptoms, such as chest tightness, wheezing and cough.

Despite years of research on asthma, the cause of this illness is still unknown. However, what is known is that there are some risk factors that predispose some individuals to this condition and exposure to some allergens and environments can also trigger asthma in some people. Some of these risk factors are genetic predisposition, race and socioeconomic status (SES). In addition environmental factors, such as exposure to allergens (e.g., dust mites, pollens, pets and, diet, tobacco smoke, and smog), can trigger asthma in some individuals. Exposure to allergens and viral infections are the main factors causing exacerbations of asthma and/or symptoms in children. Additionally exercise, expressing strong emotions, and stress can trigger asthma symptoms as well (Global Initiative for Asthma, 2006).

Asthma is one of the most prevalent chronic childhood illnesses in the world, and this prevalence has continued to increase at a high rate in the last three decades. New Zealand though a relatively small sized country, has one of the highest recorded rates of asthma prevalence in adults and children in the world, with 15% of adults and 20% of children aged between 6-14

years diagnosed with asthma (Asthma & Respiratory Foundation, 2007). In the New Zealand Health Survey (2006/07), one in seven children aged between 2-14 years (14.8%, 13.5-16.2) were diagnosed with asthma, and were taking medication for their symptoms. The survey also found that more women than men were taking medication for asthma (13.1% v 9.6%), however, there were no differences found by gender in children.

There is a higher incidence of asthma and asthma severity found within Māori and Pacific Island children. There is also a lower use of asthma medication (controllers and preventers) for Māori and Pacific Island children, and in children from lower socioeconomic (SES) groups, despite a higher number of asthma symptoms reported in these children. Within lower SES groups, there are a greater number of smokers and poorer housing reported, however, this does not entirely explain the greater number of hospital admissions and asthma prevalence in this group (New Zealand Health Survey, 2006/07).

Not only can asthma cause extra stress on children and their families, including days off school, sleepless nights, hospitalisations and in some cases even death, asthma also puts a large financial burden on families and society. Economic costs include the cost of pharmaceuticals, hospitalisation costs and access to emergency after hours care. The Pharmaceutical Management Agency of New Zealand (PHARMAC) reported that the budget for asthma medication was 60 million dollars in 2002-2003. In 2000-2001 there were 4,390 children aged under 15 years admitted to hospital with asthma, the average stay in hospital for these children was 2.4 days which equates to 10,000 days in hospital. Around 12,000 children attended the emergency department in the same period, with a cost of approximately \$250 per visit, this equated to a total annual cost of three million dollars. Additional costs to society include parents having to take

days off work to care for their child at home when required; with this equating to lost productivity in the workforce and loss of income for parents (Shaw, 2006).

Children with asthma not only have a chronic disease that impacts on their lives, but they are also more likely to have behaviour problems, compared to children without asthma (Stevenson, 2003; Alati, O’Callaghan, Najman, Williams, Bor & Lawlor, 2005; Halterman, Conn, Forbes-Jones, Fagnano, Hightower & Szilagyi, 2006; Blackman & Gurka, 2007). The reason for increased behaviour problems in children with asthma is still unknown as is the cause of asthma itself. However, McQuaid, Kopel and Nassau (2001) suggest that parental stress may increase with intensifying child asthma severity and as a result, parenting difficulties may arise as the child’s illness symptoms become increasingly difficult to manage. Other factors such as poverty, family stress and general living conditions may also contribute to the increased problems because these factors can all contribute to the development and intensification of asthma and behavioural difficulties.

Because the early childhood years are a time of rapid physical, intellectual and emotional development, the stress that asthma places on children and their families can be significant. Families with poorer psychological and social functioning and less adequate parenting are more likely to have children with asthma and with behaviour problems (Kaugars, Klinnert & Bender, 2004).

Studies that have examined behaviour problems in children with asthma have often separated behaviour problems into two categories, internalising and externalising behaviours. Specific behaviours encompassed by the construct of externalising behaviours include “acting out”, “disruptive”, and “under controlled” behaviours and destructiveness, deceitful behaviour, truancy, temper tantrums, argumentativeness, defiance, harassment of others, frequent frustration

and negative affect, anger, resentment, spite and vindictiveness (American Psychiatric Association, 2000). In the Child Behavior Checklist (*CBCL*; Achenbach & Edelbrock, 1983) the externalizing behaviours are identified as: “temper tantrums or hot temper”, “unusually loud”, “screams a lot”, “inattentive or easily distracted”, “destroys things belonging to his/her family or others”, “gets in many fights”, and “can’t concentrate, can’t pay attention for long”.

In contrast, internalising behaviours are behaviour problems that are directed inward. These include behaviour problems such as being withdrawn, anxious, inhibited and depressed behaviours. Internalising behaviours that are itemized in the *CBCL* (Achenbach & Edelbrock, 1983) include: “cries a lot”, “would rather be alone than with others”, “nervous movements or twitching”, “trouble sleeping”, “underactive, slow moving, or lacks energy”, “too shy or timid”, “stares blankly”, “sulks a lot”, “sudden changes in mood or feelings”, and “clings to adults or too dependent”.

In Britain, special education legislation refers to emotional and behavioural difficulties in children and young people as a disability that is defined as children and young people who demonstrate features of emotional and behavioural problems, such as: are disruptive and disturbing, are withdrawn and isolated, are hyperactive and lack concentration, and have challenging behaviours (Department for Education and Skills, 2001, as cited in Church, 2003, p.52). In New Zealand, children with severe behaviour problems are defined as children who engage in behaviour which (a) jeopardises the physical safety of themselves or others, or (b) threatens to cause, or causes, significant property damage, or (c) severely limits the child’s access to ordinary settings and interferes with his or her social acceptance, sense of personal well being, and educational performance (Church, 2003).

As previously mentioned, asthma can lead to children missing days from school and therefore missing important educational opportunities, as well as missed social opportunities. Children who have asthma and behaviour problems are at a much greater risk for missed academic and social opportunities in the classroom, and their behaviours can also add extra stress to some already stressed families. Without an appropriate intervention, these children may be less likely to control their asthma symptoms effectively and could be on a life course trajectory of increasing behaviour problems in the future (Fergusson & Horwood, 2002). If as some authors suggest parental stress, poverty and living conditions contribute to increased asthma and behavioural problems in children, then would these same factors lead to increased behaviour problems in these children's brothers and sisters who do not have asthma? Or is it the condition of asthma itself that is causing children to have greater behaviour problems than children without asthma? It is important to explore the relationship between asthma and behaviour problems in children so that those children who experience asthma and behaviour problems may have additional support and intervention to help with giving them improved quality in their physical, social, family, educational and emotional lives.

## CHAPTER 2

### LITERATURE REVIEW

As well as physical symptoms like coughing, wheezing, and difficulty breathing, children with asthma are also at increased risk of behavioural, emotional, and development problems (Blackman & Gurka, 2007). The purpose of this literature review was to review and critique the studies that examined behaviour problems in children with asthma, and additionally, studies that included siblings of children with asthma.

The foundation of this review is a comprehensive meta-analysis by McQuaid, Kopel and Nassau (2001). They reviewed 26 studies of behavioural problems in children and adolescents with asthma. Additionally, other Peer-reviewed articles were searched using electronic databases (e.g., ERIC, PsychINFO, PsychARTICLES, Pub MED, MEDLINE and Google Scholar), using the keywords “behav\* problems”, “behav\* difficulties”, “child\*”, “asthma”, “sibling/s” and “famil\*”. All duplicate copies of studies were removed. Research studies not relevant to this present study were also removed. Studies needed to include a sample of children with asthma and with no other chronic illness; studies had to be community based and be published in English. There were no studies found that included children with asthma and behaviour problems and included their sibling/s.

### *Do children with asthma have behaviour problems?*

Since the late 1960s, researchers started to attempt systematic assessments of psychiatric disorders and behaviour problems in children with asthma. Early studies indicated that there was only a small increase of behaviour problems in children with asthma compared with children without asthma. In the following decades, research showed that children with asthma had increased levels of behaviour problems, and in 2001 a meta-analysis over the previous 25 years was published by McQuaid, Kopel and Nassau (2001). A meta-analysis is a way of summarising research literature using established quantitative methods. Their published meta-analysis reviewed behavioural adjustment in children with asthma. The authors reviewed 26 studies, on over 5,000 children with asthma, aged between 4-19 years. Across these 26 studies they found that children with asthma had more behavioural problems relative to the reference group (either normative groups or control groups), (Cohens's  $d = .57$ , 95% CI = .42 - .72). This difference represents a half standard-deviation increase in behaviour problems in children with asthma than for the children without asthma. Some of the 26 studies analyzed used control groups and others normative samples. Further calculations gave an effect size for global adjustment based on the type of comparison group. Results were highly consistent; children with asthma have more behaviour problems relative to children without asthma (Cohen's  $d = .74$ , 95% CI = .53-.94) and relative to normative data (established normative data, comparative for age range and gender distribution) (Cohen's  $d = .62$ , 95% CI = .03-1.22).

Since the McQuaid et al. (2001) review, there have been further studies examining behaviour problems in children with asthma, and examining possible factors for this occurrence. Recent studies (Stevenson, 2003; Alati, O'Callaghan, Najman, Williams, Bor & Lawlor, 2005; Halterman, Conn, Forbes-Jones, Fagnano, Hightower & Szilagyi, 2006; Blackman & Gurka,

2007) show there is a greater prevalence of behaviour problems in children and adolescents with asthma, compared with those who have no asthma thus supporting the findings of the McQuaid et al. (2001) review.

One of the studies investigating behaviour problems in children with asthma was by Stevenson (2003). In this study parents of children with asthma (N=150) and parents of children without asthma (N=115) were interviewed. The questionnaire used was the *Behavior Screening Questionnaire (BSQ)*; Richman & Graham, 1971). This is a semi-structured screening interview. The overall findings indicated that children who had asthma were shown to have more behaviour problems compared to children with no asthma [ $F(1, 261) = 7.68, p < 0.006$ ]. However, the author did not list what the specific problem behaviours were reported by the parents in the study.

Alati et al., (2005) studied 5,135 children for asthma and having behaviour problems in Australia. The children's mothers reported on their child's asthma symptoms at age 5, and completed the *Child Behaviour Checklist (CBCL)*; Achenbach & Edelbrock, 1983) when their children were 5 years old. Then, at age 14 years, the same children completed the *Youth Self Report (YSR)*; Achenbach & Edelbrock, 1983) and their mothers completed the CBCL. The total amount of children with asthma was 1,334, this included children with asthma at 5 years only (N=73), children with asthma at 14 years only (N= 980) and children with asthma at both 5 and 14 years (N=281). The findings showed that children with asthma symptoms at 5 years of age were more likely to have internalising behaviour problems at age 14 years than children without asthma, 1.38 (95% CI, 0.86-2.03) for the YSR and 1.92 (95% CI, 1.28-2.88) for the CBCL. Children that had asthma at age 5 years and 14 years had the highest prevalence of internalising behaviour problems, although the specific types of behaviour problems were not reported.

Halterman et al. (2006) studied the relationship between asthma symptoms in children and behaviour problems from a community-based sample in New York. Included in their study were 1,619 children entering kindergarten aged between 4 – 6 years. The parents or caregivers of the children completed a detailed health and development survey, the *Parent's Appraisal of Children's Experiences* (PACE). The PACE survey includes questions that regard the child's demographic background, medical history and behaviour. Behavioural problems were assessed from 12 items in the PACE survey, which were divided into four behavioural subscales; positive peer social skills ("talks easily with other children", "has many friends"); task orientation ("has a short attention span", "concentrates well"); negative peer social ("fights with other children", "hurts others"); and shy/anxious behaviour ("is withdrawn", "gets nervous easily"). Each child's asthma status was assessed from the *PACE* survey which included three questions about asthma symptoms. Of the 1,619 children, 15% had asthma symptoms (7% intermittent, 8% persistent). Persistent asthma symptoms were defined as having asthma symptoms more than two days a week, waking at night more than once a month because of symptoms, or more than three visits to an emergency department for asthma in the last year. Intermittent symptoms were defined as having some asthma symptoms but less severe than those in the persistent category. The findings of this study showed that children with asthma had a higher number of behavioural problems across several domains compared with children with no asthma. They also found that children with more severe asthma had increased behavioural problems; more than 20% of children with persistent symptoms were over one standard deviation (SD) higher than average on two or more behaviour scales compared with 16% of children with intermittent symptoms and 10% of children with no asthma symptoms.

A recent study looking at behaviour and asthma in children was by Blackman and Gurka (2007) in the USA. Over 100,000 children aged from 0- 17 years were randomly selected from the National Survey of Children's Health. The study looked at the association between asthma and rates of developmental and behavioural problems. Parental interviews were conducted in English and Spanish in all states in America. Their findings showed that children with asthma were twice as likely to have behaviour problems compared to children without asthma. Behavioural problems were found in 10.8% of all the children with asthma and 4.7% of children with no asthma, and as high as 21.6% in children with severe asthma.

The meta-analysis review of McQuaid et al. (2001), and the studies by Stevenson (2003), Alati et al. (2005), Halterman et al. (2006), Blackman and Gurka (2007) indicate that there appears to be a higher number of behavioural problems in children and adolescents with asthma, than children and adolescents without asthma.

*What are the behaviours that children with asthma exhibit?*

As mentioned, the types of specific behaviours that are found more in children with asthma than in children without asthma are not always listed in the literature, although studies on behaviour problems in children with asthma sometimes separate behaviour into two categories, internalising and externalising behaviours.

The McQuaid et al. (2001) meta-analysis found that children who have asthma were more likely to have more internalising and externalising behaviour problems than children who do not have asthma. Additional findings were that the children with asthma also had greater internalising problems than externalising behaviour problems, with the effect size (Cohen's  $d = .73$  vs.  $.40$ ).

Klennert, Nelson, Price, Adinoff, Leung and Mrazek (2001) found more internalizing behaviour problems in children with asthma aged 6-14 years, when compared to the same aged

children without asthma. Similar findings were found in the study by Alati et al. (2005) where their findings showed that, at 14 years, adolescents were more likely to have internalising behaviour problems if they had asthma symptoms at age 5, odds ratio 1.38 (95% CI, 0.86-2.03) for the YSR and odds ratio 1.92 (95% CI, 1.28-2.88) for the CBCL. Additionally, children with symptoms of asthma at both age 5 and 14 years had the highest prevalence of internalizing symptoms. However, internalising symptoms at age 5 were not associated with the development of asthma symptoms at age 14 years.

Other studies have found more externalising and internalising behaviour problems in children with asthma. Kashini, Konig, Shepperd, Wilfley and Morris (1988) investigated self-concept and behaviour problems in children with asthma. Participants in the study were parents of 56 children with asthma aged between 7 to 16 years of age, and parents of 56 children without asthma (matched control with regard to age, race and sex). The parents completed the CBCL (Achenbach & Edelbrock, 1983) on their child's behaviour. The findings were that children with asthma were rated as having more behavioural problems than the children without asthma for both, internalising behaviour problems,  $t(110) = 2.35, p < 0.021$ , and externalising behaviour problems,  $t(110) = 2.10, p < 0.38$ .

Calam, Gregg, Simpson, Simpson, Woodcock and Custovic (2004) identified the types of behaviours that were problematic for children with asthma in their study. Parents completed questionnaires on child behaviour, family functioning and parental mental health; additionally parents reported on their child's history of wheeze. The children at age five years were grouped into 'never had wheeze' (N = 374) and 'late-onset wheeze' (N = 37), (there were also two other groups, persistent wheeze and transient early wheeze, however these groups were not used by the authors for the final analysis). Significant differences between the groups 'children with late

onset asthma' and 'no asthma' were found from the results of the *Eyberg Child Behavior Inventory* (ECBI; Robinson, Eyberg & Ross, 1980). Children with 'late onset asthma' were found to destroy toys and other objects (13.5 %), compared with (2.7%) of children that had 'never had asthma'. Other behaviours where children with 'late onset asthma' scored higher than children 'without asthma' were; "teases or provokes other children" (13.5% v. 2.9%), "argues with peers" (8.1% v. 2.4%), "seeks attention"( 16.2% v. 6.4%), "is easily distracted"(8.1% v. 2.1%), "has short attention span"(8.1% v. 2.4%), "fails to finish task"(8.1% v. 2.1%), "has difficulty concentrating"(8.1% v. 1.3%), and "is overactive or restless"(16.2% v.2.1%). This study also found that children with asthma had more behavioural problems than children without asthma, and the authors listed the specific behaviours that were a problem in these children.

Another study that listed specific behaviour problems found in children with asthma was by Liberty and Edgin (2004). In their study of 228 children (mean age 9 years), they looked at school achievement and additionally behaviour problems using the *Revised Conners' Parent Rating Scale* (CPRS-R; Conners, Sitarenios, Parker, & Epstein, 1998). From their sample, they identified 86 children with asthma and 142 children without asthma. Their findings showed that the total problem scores from parent report were not significantly different between children with and without asthma, however, there were differences shown in the types of behaviours reported. Temper outbursts in children that had asthma occurred in 12.6% of the children compared with 4.2% of children with no asthma. For children who had asthma in the last 12 months, 14.6% worried a lot, compared with 6.3% of children who has not experienced asthma. There were also more drastic mood changes reported (14.6% v. 4.2%), and children with asthma were more likely to be uncooperative (20.7% v. 7.7%) and unhappy (16.7% v. 3.5%) than the children with no asthma symptoms. Another main finding from this study was that children with asthma were

more likely to be low achievers at school compared to children without asthma. In the previous 12 months, children with asthma were 25% more likely to be low achieving (18.9% for children without asthma) compared to average-high achievers. Additionally for children that had asthma, they rated highly for low achievement, (48.8% children with asthma vs. 33.3% children without asthma).

In the study by Halterman, et al. (2006) specific behaviour problems where children with asthma scored significantly different in comparison compared to children with no asthma were; task orientation (2.85 vs. 3.03;  $p=0.006$ ) and on the shy/anxious behaviour subscale (2.11 vs. 1.89;  $p<0.001$ ).

From these studies and the findings of the meta-analysis by McQuaid, et al. (2001) children with asthma not only have more behaviour problems compared to children without asthma, they also have been reported to have a range of behaviour problems from internalising behaviours, anxious and withdrawn, to externalising behaviours, overactive and defiant manifestations of coping difficulties.

#### *Diagnosed Mental Health Disorders*

Children with asthma may be at a higher risk of having a psychiatric disorder. Bussing, Burket, and Kelleher (1996) used structured diagnostic interviews to assess anxiety disorders in children with asthma. The Instrument used was the *Schedule for Affective Disorders and Schizophrenia for School-Age Children* (K-SADS; Puig-Antich & Ryan, 1986) to interview 37 children with asthma and 25 children without asthma aged from 7 -17 years. The results showed that children with asthma were twice as likely as children without asthma to be diagnosed with anxiety disorders ( $p < .05$ ).

Kashini et al. (1988) findings from their study that investigated self-concept and psychopathology in children with asthma, indicated that although the children with asthma reported more psychological symptoms on average ( $M=7.43$ ) than the children without asthma, these differences were not significant,  $t(110) < 1$ . However, the parent report from the *Diagnostic Interview for Children and Adolescents –Parent Version* (DICA-P; Herjanic & Reich, 1992, as cited in Kashini et al., 1988), suggest differences between the average number of symptoms reported, with the parents of children with asthma reporting more symptoms,  $t(110) = 1.95, p < .05$ , than the parents of children without asthma. Parents of the children with asthma also reported a larger number of overanxious symptoms in their children ( $M = 1.41$ ),  $t(110) = 2.20, p < .030$  and they further reported their children as having more phobic symptoms, than the parents of children without asthma ( $M= 0.25$ ),  $t(110) = 2.57, p < .012$ .

Vila, Nollet-Clemencon, De Blic, Mouren-Simeoni, and Scheinmann (1998), assessed the presence of psychological disorders in 92 children with asthma aged 8 to 17 years. They found that anxiety disorders were more prevalent among children with moderate and severe asthma (36%) than children in the general population. Ortega, McQuaid, Canino, Ramirez, Fritz and Klein (2003) examined the presence of asthma and various psychological conditions in a community sample of 1,890 Puerto Rican children. The *Diagnostic Interview Schedule for Children* (DISC; Costello, Edelbrock, Kalas, & Duncan, 1984) and the History of Family Psychopathology Questionnaire (Lish, Weissman, Adams, Hoven, & Bird, 1995) were used to assess for anxiety symptoms and anxiety disorders. The findings indicate that in the 1,890 children, 20% of the children diagnosed with asthma also met criteria for a psychological disorder, with anxiety disorders (9%) and disruptive behavioural disorders (15%) being the most common psychological diagnoses associated with asthma. From this study, Ortega, et al. (2004)

further analyzed the data to examine the association between anxiety disorders and asthma. They found that the children with a history of asthma reported experiencing significantly more physiological symptoms such as, generalized anxiety and separation anxiety disorder ( $\chi^2 = 5.13, p < .05$ ).

Blackman and Gurka (2007) used telephone surveys with parents of 102,353 children, ranging in age from birth to 17 years old. The findings showed that parents of children with asthma were twice as likely to report that their child had severe problems with behaviour, emotions, concentration or difficulties getting along with others. They also found that children with asthma were at an increased risk for attention deficit hyperactivity disorder (ADHD), depression, behavioural and conduct problems, and learning disabilities. The study further suggested that depression, anxiety, behavioural problems and learning disabilities were common among children with asthma, with ADHD found to be twice as common among children with asthma. Furthermore, 10 % of the children with asthma experienced problems that lasted longer than a year and required counselling or treatment. These children often missed ten or more days of school, leading parents and caregivers to worry about their children's health, academic and emotional development.

#### *Behaviour problems preceding asthma onset*

Some researchers have reported that behaviour problems could actually precede asthma onset in children (Calam, et al., 2004; Stevenson, 2003). This is an important finding, as behaviour problems were initially thought to stem from the associated problems of having asthma or having a child with asthma. Stevenson (2003) suggests that behaviour problems could precede asthma onset. The children in this study were divided into two groups, those with asthma at 53 months ( $N = 150$ ) and those without asthma ( $N = 115$ ). The *Behavior Screening Questionnaire*

(BSQ; Richman and Graham, 1971) was administered at 35, 41, 47 and 53 months. The children with no asthma (by 53 months) had the lowest BSQ scores at all ages. The children that had asthma onset after 35 months had higher BSQ scores at 35 months (before asthma onset) than the children who did not have asthma. The mean behaviour score was as high as it was for children that already had asthma by 35 months. The authors suggest that behaviour problems could be a marker for other causally important risk factors, and that behaviour itself does not play a causal role in asthma onset. Elevated problem behaviours could be an indicator of acute stressors in the child's life, or a product of social disadvantage. However, in this study, asthma was associated with affluence; therefore, it is unlikely that the results were caused by an association between asthma, behaviour and disadvantage. Another possibility suggested was that asthma develops slowly in the airways before any signs are apparent and thus, behaviour problems could be an indication that the child is experiencing asthma symptoms that are not yet obvious to the caregivers or physician.

In a similar study Calam, et al. (2004) hypothesised that behaviour problems and psychosocial factors at an early age precede the development of asthma. The children in their study were part of a larger prospective study of the development of asthma and other atopic disorders in a cohort of infants (The National Asthma Campaign Manchester Asthma and Allergy Study). The children that were included in this study (N=683) were from a group whose parents had returned the psychological questionnaires when their child was at aged 3 years and had attended the follow-ups at both age 3 and 5 years were included in the final analysis. The children were followed prospectively, and attended review clinics at age 3 and 5 years. The children were then allocated into one of four groups, these were:

1) No wheezing: no recorded wheeze during the first three years of life, and no wheeze at age 5 years.

2) Transient early wheeze: at least one episode of wheezing during the first three years of life, but no subsequent wheezing reported at age 5 years.

3) Late-onset wheeze: no recorded wheeze during the first three years of life, but reported wheezing in the last 12 months at age 5 years.

4) Persistent wheeze: at least one episode of wheezing during the first three years of life, and reported wheezing in the previous 12 months at age 5 years.

To test the hypothesis that behaviour problems start before the development of wheeze, the data of two of the groups were used for comparison; children that had late-onset wheeze and children who had never wheezed. The findings showed that there were no differences between children with late-onset wheeze and children that had never wheezed for scores on the Eyberg Child Behavior Inventory (*ECBI*; Eyberg & Robinson, 1983) Intensity (mean 95% confidence intervals: 97.4, 95.3-99.5 vs. 102.5, 92.6-112.1 respectively,  $p = .3$ ). There were also no differences between the two groups for actual scores on the Problem Scales (median, interquartile range: 1, 0-5 vs. 2, 0-7.5 respectively,  $p = .3$ ). Children that had late-onset wheeze were found, however to be more likely to have intensity and problem scores on the *ECBI* above the clinical cut-offs at the age of 3 years (both Intensity and Problem scores:  $p < .001$ ).

#### *Factors contributing increased behavioural problems in children with asthma*

Since the McQuiad et al. (2001) review, other researchers have published their research on why children with asthma were more likely to have behaviour problems. Asthma and behaviour problems may be bi-directional, in that, asthma symptoms cause parents to experience

greater stress and this can lead to them being more critical of their children, who in turn become upset and thus increase the likelihood of an asthma attack and/or increased behaviour problems.

#### *Asthma severity*

Vila, Nollet-Clemencon, De Blic, Mouren-Simeoni, and Scheinmann (1998), demonstrated parent-rated behaviour problems were significantly associated with asthma severity (i.e., mild asthma  $N = 12$ ;  $M = 44.6$ ,  $SD = 11.2$ , moderate and severe asthma  $N = 80$ ;  $M = 54.6$ ,  $SD = 11.3$ ).

Bussing, Halfon, Benjamin and Wells (1995) from their study of 5 to 17 years old children with asthma and a co-morbid medical condition, had a mean BPI score of 7.3, compared with 5.4 for children without chronic conditions, and all subscale scores, except those for antisocial conduct and immature behaviour, were significantly elevated. Children with severe asthma alone had nearly three times the odds of behavioural problems, (odds ratio, 2.96; 95% confidence interval, 1.22 to 7.17) and children with asthma, plus co morbid conditions, nearly twice the odds (odds ratio, 1.86; 95% confidence interval, 1.20 to 2.90) of children without chronic conditions to have severe behaviour problems.

In contrast, there was no association between asthma severity and behaviour problems reported by parents of 6 year old children with asthma, in a study by Klinnert, McQuaid, McCormick, Adinoff and Bryant (2000), although difficulties with emotional regulation were associated with increasing asthma severity.

McQuaid, et al. (2001) analysis of 26 studies, found that differences between parental ratings of child behaviour problems increased when healthy children were compared to children with increasingly severe asthma. Effect-sizes of Cohen's  $d = 0.14$ ,  $0.25$  and  $0.48$  were detected between healthy children and children with mild, moderate, and severe asthma. These results

suggest that there may be a relationship between asthma severity and behaviour problems. The authors proposed that parental stress may increase with intensifying child asthma severity and consequently parenting difficulties may arise as the child's illness symptoms become increasingly difficult to manage. These propositions, however, could not be verified during the meta-analysis by McQuaid et al.(2001) as the reviewed studies did not specifically investigate the role of these factors in the relationship between asthma and behaviour difficulties.

Blackman and Gurka (2007) also studied asthma severity and behaviour problems. Findings from their study showed that the more severe the asthma, the more severe the behavioural, emotional, and developmental problems, were in these children. Their study also found that depression, anxiety, behavioural problems and learning disabilities are co-morbidities common among children with asthma, with these problems found to be four times more likely in children with severe asthma. The more severe the child's asthma was, the higher the incidence of these types of problems. Blackman and Gurka (2007) also reported that ADHD was twice as common among children with asthma and three times more common among those with severe asthma.

The overall findings suggest that children with severe asthma are more likely to have a greater number of behaviour problems. However, it is unknown whether more severe asthma leads to increased behaviour problems or whether psychological problems leads to more severe asthma.

#### *Parental and Family influences*

Klennert, Kaugars, Strand and Silveira (2008) studied 98 children from ages 9-24 months through to age 4 years. The children and infants were assessed for respiratory illness and severity, and were enrolled in an intervention. Parents completed the *CBCL* when their children were aged

four. Other information gathered were environmental factors, such as maternal smoking, maternal mental health and family cohesion. Klinnert et al. (2008) found that maternal mental health and family stresses were associated with greater behaviour problems in children by the age of four years. Early illness, severity and hospitalisation were not predictors of behaviour problems in the children. However, families with a negative emotional environment were associated with both asthma and behaviour problems in children at age four. The authors suggested that both asthma and behaviour could be influenced by a common factor and further research is suggested in this area.

Low mental health scores in caregivers in a study by Wood, Smith, Romero, Bradshaw, Wise and Chavkin (2002) was associated with children in their care experiencing more asthma symptoms and more acute care visits for asthma, compared with caregivers with higher mental health scores. Parent's responses to high levels of stress and managing chronic stress may affect their own psychological functioning and their children's asthma symptoms. Mrazek, Casey, and Anderson (1987) found a significantly greater proportion of preschool children with asthma were rated as having an insecure attachment and having more behaviour problems than children that were rated as having a secure attachment. The authors concluded that a secure attachment between parent and child might mediate the effects of early illness on children's development, thus enhancing the child's coping capacity, minimizing emotional, and behaviour problems. High levels of conflict within families can place children at greater risk for physical and mental health problems than children without conflict in their homes. In a study that examined conflict and children hospitalised for asthma, children that experienced more conflict at home were more likely to have a greater number of lifetime hospitalisations (Chen, Bloomburg, Fisher & Strunk, 2003).

Kozyrskyj, Mai, McGrath, HayGlass, Becker and MacNeil (2008) in their study looked at a cohort of 13,907 children aged seven years, and maternal distress and asthma. Asthma status was derived from health care records. Their population-based study showed an increased risk of childhood asthma (OR, 1.25; 95% CI, 1.01-1.55) among children exposed to continued maternal depression and/or anxiety from birth to age seven years. Exposure to maternal distress in the first year of life was not associated with asthma. Additionally they found that maternal distress was associated with asthma in children that were from high income families than low income families, (OR 1.44; 95% CI, 1.12-1.85).

Schobinger, Florin, Reichbauer, Lindermann and Zimmer, (1993) examined family influences on childhood asthma, they found that in comparison to children that do not have asthma, parents of children with asthma made significantly more critical remarks and showed more critical attitude towards their children. Increased frequency of asthma attacks and asthma severity were also associated with critical attitudes from mothers but not from fathers.

These studies indicate that family functioning can be an important factor in determining how asthma affects children. The onset of physical illness such as asthma in some children is likely to place strain on their parents, which, if not managed appropriately, may lead to stress within the family system. Such stress may increase asthma severity because it impedes parents efforts to manage their children's medication compliance and symptom management (Kaugars, et al., 2004).

Parenting difficulties when examined have been found to impact negatively on asthma outcomes in children (Mrazek, Klinnert, Mrazek, Brower, McCormick & Rubin, 1999). Klinnert, Mrazek, and Mrazek (1994) assessed the effects of parenting stress and parenting style on the development of asthma. Their sample consisted of 150 women who were pregnant at the time of

the study. Interviews were conducted during the first and third trimesters and three weeks after their child was born. The mothers and children were followed for three years. The mother's interactional style with her infant was also assessed. Significantly, more mothers of children who developed asthma by age 3 years were rated as having problematic parenting behaviour. The combination of problematic parenting style and parental stress was found to predict asthma onset, with 25% of children from high-stress/problematic parenting families developing asthma compared to 5% of children from low-stress/adequate parenting families. In a follow-up study using the same sample of mother-infant dyads, Mrazek et al. (1999) evaluated the contribution of different risk factors to asthma onset. Risk factors included; three infections before one year of age, blood testing, parenting difficulties, eczema, breast-feeding, gender, genetic risk, socioeconomic status, and parental smoking. Parenting difficulties were defined as maternal depression, quality of marital relationship, history of psychological illness, emotional involvement with the child, and quality of parenting behaviours. Out of the eleven variables tested, only frequent infection ( $or = 5.4, p < .01$ ), blood levels ( $or = 4.6, p < .01$ ), parenting difficulties ( $or = 3.9, p < .05$ ), and eczema ( $or = 3.1, p < .05$ ) were significantly associated with asthma onset. Taken together, the four risk factors accounted for 55% of the variance in asthma onset, while parenting difficulties alone accounted for 6%. Parents who were emotionally involved with their child and exhibited high quality parenting behaviours were found to have infants who had only a 2% risk of developing asthma.

Another factor in accounting for behaviour problems in children is that parents do not treat children in the same family identically (Rivers & Stoneman, 2008). Within-family differences in parenting styles experienced by children is referred to as differential parenting. Differential parenting is associated with negative sibling outcomes, including less prosocial

behaviour and engagement. Researchers have reported increased differential parenting in families with a child with a disability, with parents generally favouring the children with disabilities (e.g., Lobato, Faust & Spirito, 1998). However, evidence suggests that it is not the amount of differential parenting that impact on siblings, but the child's understanding of differential parenting. Children do not always mind that they are treated differently from their sibling/s, as long as they perceive the differences as being fair (McHale, Updegraff, Jackson-Newsom, Tucker & Crouter, 2000).

### *Stress in children*

Mullins, Chaney, Pace and Hartman (1997) hypothesized that increased psychological distress among children with asthma was due to the intermittent, unpredictable, and the reversible nature of asthma symptoms. These characteristics contribute to variable expectations and significant uncertainty about the illness and therefore may precipitate behavioural problems. Stress can also alter children's physiological regulatory systems and impact on immune functioning, which are associated with allergy and airway inflammation. In addition, children that have asthma appear to have an increased cortisol response to acute stress that may then increases asthma attacks after exposure to stress.

Perceived uncertainty/unpredictability is associated with emotional difficulties in individuals across multiple chronic medical conditions; these difficulties can exacerbate and lead to increased behaviour problems in some individuals (Mullens et al., 1997). Illness uncertainty and unpredictability associated with asthma may contribute to long-term emotional and behavioural adjustment problems in children. For instance, Mrazek, Schuman and Klinnert (1998) found that in a sample of 150 children, those with asthma onset before the age of 3 years yielded a greater number of behaviour problems at ages 3, 4, and 6 than children with asthma

onset between the ages of 3-6 ( $p > 0.05$ ). Therefore, the early development of asthma and the stressors associated with their chronic presence may put children at particular risk of developing behaviour problems.

### *Medication*

Another factor complicating the investigation of the relationship of asthma and behaviour problems are the side effects from asthma medication. Reported side effects of taking asthma medications can include impaired memory, mood swings, motor skills, attention, hyperactivity, irritability, lethargy and sadness (Milgrom & Bender, 1993).

The effects of theophylline were investigated in two studies in the early nineties (Bender, Lerner, Ikle, Comer & Szeffler, 1991; Bender & Milgrom, 1992). Children with asthma took either theophylline or a placebo in this study. The children taking theophylline as opposed to placebo tested for enhanced memory and attention but experienced hand tremors and anxiety. The parents of children taking theophylline as opposed to a placebo reported more hyperactivity and conduct problems than did parents of children taking the placebo. However, a comprehensive literature review conducted by Bender and Milgrom (1995), concluded that there was little conclusive evidence to suggest that asthma medications such as prednisone and theophylline were directly responsible for behaviour problems in children. Bender, Iklé, DuHamel and Tinkelman (1998) who found that the use of theophylline medication was not significantly correlated with behaviour problems later supported this finding. In the Bender, et al. (1998) study, parents of more than 100, 6- to 17-year-old children with asthma completed behavioural questionnaires at the beginning of the study, at one month and one year. The children, who all had been diagnosed with asthma on average for 7 years were tested for attention, concentration, memory, problem solving and learning skills. The children were given beclomethasone and

theophylline in this study, with no significant side effects reported in the children using either medication.

The findings regarding the effects of prednisone, a type of corticosteroid, were different to those of theophylline. Children taking prednisone displayed higher rates of mood, attention and memory problems, however, such effects were no longer detected 24-48 hours after taking the medication (Milgrom & Bender, 1993a). A literature review of the effects of corticosteroids conducted by Stuart, Segal and Keady, (2005) found little evidence for adverse psychological side effects from corticosteroids. Similarly, Bender and Milgrom, (1995) stated that studies of corticosteroids and their side effects on mood, memory and attention have rarely detected clinically significant results despite statistically significant differences between treatment and placebo groups. Another study by Bender, et al. (1998) suggested that although there is weak and contradictory evidence for behavioural side effects from asthma medications in the literature, there may be a sub-group of children with asthma, that are still at a greater risk and requires further research.

### *Genetics*

Wamboldt, Schmitz, and Mrakek (1998) proposed that the association between asthma and behaviour problems arise through shared genetic influences. Stevenson (2003) suggested that from this genetic basis, early behaviour problems could be a marker of pathophysiological processes that have yet to manifest as a clinical diagnosis of asthma. Compounding this is that children with high genetic vulnerability to asthma are likely to receive more effective support from their parents than children with a low genetic vulnerability, potentially because of their parents' higher likelihood of having had to manage asthma symptoms themselves (Calam, Gregg, Simpson, Morris, Woodcock & Custovic, 2003).

### *Socioeconomic Status*

Gillaspy, Hoff, Mullins, Van Pelt, and Chaney (2002) found that members of low socioeconomic status (SES) groups tend to be at higher risk for asthma and asthma-related complications. In general, low SES has been associated with a number of direct and indirect effects on health conditions, including asthma. Low SES is associated with higher rates of asthma prevalence, morbidity and mortality among minority children and adolescents.

The literature indicates that children and adolescents with asthma, including those of minority and low SES status, are at a greater risk for psychological distress and behaviour problems than healthy children (Kashani, et al., 1988; MacLean, Perrin, Gortmaker, & Pierre, 1992). In a prospective study of children examining asthma onset and persistence, SES was not found to be associated with asthma at ages 6 to 8 years, however, families from lower SES were more likely to be rated as having parenting difficulties early in the child's life, which was also associated with infants having more respiratory infections. Additionally, mothers from low SES families breastfed for a shorter period and were more likely to smoke during their infants first year of life, thus may contribute to higher rates of asthma in this population (Klennert, et al, 2001).

One study that contradicted these findings was Hancox, et al. (2004) who found that low SES was not associated with increased rates of asthma in the population. In a longitudinal study conducted in New Zealand, Hancox et al. (2004) investigated the relationship between SES status and asthma. The study followed 1,000 people who were born in 1972-1973. The individuals were assessed for asthma and respiratory illness from childhood and into adulthood. There was no association found between asthma prevalence and SES status in this study. Low SES in childhood did not significantly increase the risk of having asthma in childhood or as an adult.

However, one of the limitations of this study was that it measured asthma prevalence but did not include asthma morbidity, for example, asthma severity and hospitalisations due to asthma.

In contrast, Blackman and Gurka (2007) found there were higher rates of severe asthma reported in children who lived in households at or below the poverty level. They concluded that although asthma, especially severe asthma put children at high risk for developmental, emotional and behavioural problems, low SES put children with asthma at a greater risk for all of these problems. Quite possibly, children who are members of an ethnic minority group or of low SES and have asthma may experience more behavioural problems than children who experience only one of these factors. Although, few studies have examined the relationship between behaviour problems and asthma specifically among minority and lower SES children, the current literature suggests that low SES (poverty) correlates to higher severity and prevalence of asthma, and higher rates of behaviour problems in children.

### *Gender*

A survey of school children in Otago, (New Zealand) 1999, found the prevalence rate of severe behaviour problems to be 7.5 percent in boys and 1.4 percent in girls (Church, 2003). Additionally, boys have higher rates of psychological problems than girls, the rate for boys is 8 - 14.4% and for girls it is 3.5 - 8.6% (Carr, 2006). Perrin et al. (1992) found in their study on children with asthma, girls had significantly higher internalising scores and total behaviour problem scores than boys before and after intervention. The authors however controlled for the effects of gender in their final analysis of the data. In the study by Alati et al. (2005), there was also a tendency for girls with a history of asthma to have increased odds of internalising behaviour, but this was not found at a statistical level, and there was no difference found between boys or girls for overall behaviour problems. Vila et al. (2000) found that girls had more anxiety

disorders and affective disorders than boys did. Although boys have higher prevalence rates for behaviour problems than girls, especially with conduct problems and hyperactivity problems (Carr, 2006), studies on behaviour and asthma in children have not found significant differences between boys and girls with asthma and behaviour problems, or have not mentioned gender, and have grouped both boys and girls together when examining asthma and behaviour problems.

### *General Health*

Calam, Gregg and Goodman (2005) conducted a survey on 9,834 children aged from 5 - 15 years. Using the *Strengths and Difficulties Questionnaire* (SDQ) to examine asthma and behaviour problems in these children, they found that children in poor health were at increased risk of behaviour problems (abnormal and borderline) on the SDQ and its subscales, regardless of asthma presence or not. Their findings indicated that it was poor health rather than asthma per se, which contribute to behaviour problems in children. However, it was not known if the children in this study were in good health because of good asthma management. In addition, because the study was cross-sectional it was not known what the direction of the relationship between asthma severity and behavioural problems were, and if there were common causal factors.

### *Siblings of children with asthma*

There have studies that have examined the sibling's behaviour for children with a chronic illness or physical or intellectual disability. Yet there have been no such studies including children with asthma and their siblings when studying behaviour problems.

Sharpe and Rossiter (2002) reviewed fifty-one studies pertaining to the siblings of children with a chronic illness. They found more internalising behaviour problems for siblings of children with a chronic illness compared to controls. The chronic illnesses investigated in the

literature-included cancer, diabetes and cystic fibrosis; however, asthma was not one of the chronic illnesses studied.

Giallo and Gavidia-Payne (2006) found that children adjust to having a sibling with a disability in diverse ways. Their study included 49 siblings aged 7-16 years and their parents. Behaviour of the children was measured using the SDQ parent report. The findings were that SES, parent stress, family time and routines, family problem solving and communication predicted the siblings' behaviour problems. Also found was that siblings' perceived intensity of daily hassles predicted sibling prosocial behaviour. The study did not include children with asthma, and the authors were not able to compare children with different disability types due to the small sample size. They also acknowledge that while it is possible that siblings of children with different disabilities' and illnesses have some shared experiences, it is important to question whether children with different etiologies should be grouped together in studies, or investigated separately. A review of six studies by Barlow and Ellard (2006) on children with chronic illness and their siblings, found mixed findings from studies on behaviour problems in siblings of children with a chronic illness. Some studies in the Barlow and Ellard (2006) review reported 25% or more of brothers or sisters of children with a chronic illness have behavioural problems, while other studies in the review found no differences between siblings and healthy controls. Again, this review did not include siblings of children with asthma.

Studies of twins are important in behavioural studies. This is because twins share a similar genetic makeup. Any similarities they share are more likely to imply a genetic influence and any differences are suggested to be from environmental influences. Saudino, Ronald and Plomin (2005) studied 3,714 (asthma not mentioned) twins at age 7 years. Using the *Strengths and Difficulties Questionnaire (SDQ)*; Goodman, 2001) they compared behavioural problems

between the siblings. Individual differences in peer problems, conduct problems, hyperactivity problems, emotional symptoms and total behaviour problems were found to be substantially heritable. The genetic influence accounted for one-third to three-quarters of the variance. Environmental influences that were shared were only negligible in outcome, environments that increased behaviour problems were non-shared by the twins, for example peer groups, accidents and differential treatment from parents.

### *Critique*

There are a number of limitations to the reported studies, firstly in many of the reported studies, specific types of behaviour problems are not mentioned (Stevenson (2003), Halterman et al., (2007), or in some studies either internalising and externalising behaviour problems are reported (McQuaid et al., (2001), Alati et al., (2005), Klinnert et al., (2001). These two limitations do not allow for identification of specific behaviours or comparison between studies. As a consequence of these limitations of the studies, differing types of behaviour problems could have been measured in the different studies mentioned. Therefore, it is difficult to ascertain if there are specific behaviour problems found in children with asthma and what these behaviour problems are, or indeed, if there are a myriad of types of problem behaviours in this population at all?

Another limitation is that most of the studies used parent-report measures of asthma prevalence and behaviour problems in children. The most common used was the *Child Behavior Checklist* (CBCL; Achenbach, 1991), although this is a standardised instrument, due to the number of items on its Somatic Complaints subscale, the CBCL is biased towards increased behaviour problems in children with chronic health problems (McQuaid, et al., 2001). This means that in studies relying on the CBCL for measuring behaviour, there could have been an

inflated level of behaviour problems reported in children with asthma. Other measures such as the *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 2001) may be a more accurate tool in measuring behaviour problems in children with asthma (McQuaid et al., 2001, Calam et al. 2005). The SDQ has only one item on somatic complaints “Often complains of headaches, stomach-aches or sickness”, which can be controlled for when analysing the data, as sub-scale scores can be prorated if at least three items have been completed.

Another methodological limitation of the reported studies is the reliance of these studies to use parental report, as this does not control for parental bias. Moreover, parents of children with asthma report more behaviour problems than parents whose children do not have asthma. The reason for this is unknown, but the additional stress caused from having a child with asthma appears to increase the chance of parents experiencing more stress, and therefore to perceive more behaviour problems in their child (Klinner, et al., 1994, Wood, et al., 2002,). Other studies have shown increased rates of asthma in children if their parents have psychological problems, for example, depression, and this too could lead to over reporting of behaviour problems in their children (Mrakek et al., 1999, Kozyrskyj et al., 2008).

Other methodological limitations from the mentioned studies are that not all of these studies used children with asthma from a wide section of SES backgrounds. Children from lower SES appear to have more behavioural problems and increased asthma severity, (Kashani et al., 1988, MacLean et al., 1992, Blackman & Gurka, 2007) although this were not the findings in the longitudinal study of asthma in a New Zealand population (Hancox et al., 2004).

In the reported studies that examine behaviour problems in children with chronic illness and their siblings, these studies did not differentiate or include children who had asthma. Another large gap in the literature was that there were no studies on children with asthma and their

siblings without asthma, and behaviour problems. Although there have been studies on children with chronic illness and their siblings, these studies did not include children with asthma and their siblings.

The limitations from the reported studies, such as the range of measures used to ascertain behaviour problems in children, plus the use of parental reports and conflicting findings in the literature on the factors contributing to asthma and behaviour problems, all affect the understanding of the relationship between asthma and behaviour problems.

#### *Focus of the Present Study*

The focus of the present study was to investigate whether there was a relationship between asthma and behaviour problems in children with asthma. This study also sought to investigate whether there was more or different behaviour problems in children with asthma compared with their siblings who do not have asthma.

The biological siblings lived in the same home, therefore sharing many environmental factors, such as SES, maternal mental health, family cohesion. As the sibling dyads shared many of the factors that are proposed for behaviour problems in children with asthma, any differences in behaviour problems could be more confidently linked to asthma. If there were no differences in behaviour problems or similar behaviour problems within the dyads then it could be suggested that shared environmental factors could influence the results. The search of the literature found no studies on children with asthma and behaviour problems and included their siblings without asthma. Asthma severity is another variable in the present study, as is the general health of both children in the sibling dyads, this study is to examine if there are any correlations between asthma severity and behaviour problems, and the general health of these children and behaviour problems. These and other variables will be controlled for when analysing the data, which will

allow for examination of whether asthma is a possible mediator in behaviour problems in children, and when comparing siblings (one child with asthma and one without) are they similar or different in the behaviours they exhibit.

## CHAPTER 3

### METHODS

This current study examined if children with asthma have more or different problem behaviours than their siblings who do not have asthma. This current study includes children who were from a larger study of 297 school-aged children, the Children's Learning Study (Christchurch, New Zealand).

#### *Ethical Approval*

Before participant recruitment and data collection, ethical approval for the proposed study was sought and obtained, from The University of Canterbury Human Ethics Committee.

#### *Source of Participants*

The Children's Learning Study (CLS) is a prospective epidemiological study researching the health states of 5- to 6-year-old children, to see if there is a relationship between the health of the children and their academic achievement by the end of their first year of school. The CLS aims are to distinguish if common health problems in children starting school affect their academic achievement at age 6, and if so how. The CLS began in 2005 and currently has 297 participants. Ethical approval for the CLS was obtained from the National Disability Health Committee.

The participants for the CLS were selected from primary schools throughout Christchurch. The schools were divided into three decile bands, low, mid and high. Then a data base computer programme randomly ordered the schools. The principals of these schools were contacted to seek approval to participate in the study. A total of 11 schools were approached, eight of these agreed to participate.

The CLS study involved two parent interviews after consent obtained; one administered when their child was 5 years of age and starting school, and again when they were 6 years of age. These interviews gathered information on family circumstances, demographics, respiratory health, general health, development, behaviour, educational experiences, out-of-school activities, friendships and strengths.

Parents reported on a range of health conditions, including asthma and/or wheeze status of 5-year-old children. The CLS acquired parental reports of children's symptoms using questionnaire items from the International Study of Asthma and Allergies in Childhood (ISAAC) (Asher, Keil, Anderson, Beasley, Crane, Martinez et al., 1995). After additional consent was obtained, the families' general practitioners (GP) were contacted to gain further information about the children's asthma and wheeze symptoms, if present. The information collected was then reviewed by a paediatric respiratory specialist if the child had asthma symptoms, then the children were categorised according to their asthma and/or wheeze status. Children displaying asthmatic symptoms in the previous 12 month period were classified as having "current" asthma and/or wheeze.

#### *Selection Criteria*

Participants were included in this study if they were currently part of the CLS. There were five criteria of acceptance; firstly, the participants were included if they had a child with current asthma and another child that did not have asthma. Secondly participants were included if their children were had the same biological mother and biological father, and if they and the prospective child participants were living in the same home. Thirdly, only children and parents who had English as a first language were included in this study. Fourthly, children without asthma were excluded if they were 3-years-of age or younger, or if they were 12 years of age or

older. Finally, all parents were excluded from this study if they had any child with a chronic health condition other than asthma.

### *Recruitment of Participants*

Parents with a child in the Children's Learning Study were approached if they met the above criteria (as determined by records of the CLS) and had a child in the study with asthma, and at least one other child. To recruit parents and their children, the researcher sent letters to the parents from the list generated from the CLS who met the above criteria. The researcher was blind to the behaviour problems, if any, of the children, and their functional asthma severity rating. As a general procedure, a prospective parent was sent a letter describing the study, and stating that they would be phoned regarding possible participation (Appendix A). The parent was then telephoned three days later by the researcher, and asked if they would be interested in participating in the present study, and the screening questions were administered. The Screening Questions and the actual recruitment are described below.

### *Screening Questions*

- 1) Does your child (child's name - from the CLS study) still have asthma?
- 2) Do you have another child who does not have asthma?
- 3) Are these two children biological siblings?
- 4) Are they both living with you?
- 5) Do any of your children have a chronic illness or disability, (other than asthma), for example, cancer, diabetes, or cerebral palsy?

### *Recruitment Process*

The researcher was given a list of four potential families for the study from the CLS. The researcher then sent out letters to these families. After three days the researcher rang the parents from the list. If they were not home, then they were rung in the proceeding days until contact was made. Once contact was made by telephone, the parent was asked if they had received the introductory letter, and if they were interested in knowing more. If the parent was interested they were asked the screening questions. Of the first four families all were contacted over a week, however, none of them met criteria for participation. Another list of three to four families was generated and given to the researcher and the above procedure was followed again.

In all 18 families were contacted, the parents were interested in participating in the study, however, eight of the families did not meet the criteria for the current study. Of these, two of the families the child with asthma did not have asthma any longer, five of the families had a child with asthma, but their sibling had asthma also, and in one family, the siblings did not have the same biological parents. This left 10 families who met the criteria and were willing and able to participate (20 sibling dyads).

As each parent met criteria to participate, they were asked individually where and when they wanted to have the parent interview at their home (five parents were interviewed in their home), or by telephone (five parents were interviewed over the telephone). If the parents chose to be interviewed by telephone, a consent form was posted to them, which they were asked to send back signed to the researcher in a pre-paid envelope. If they were interviewed in their home, they were given the consent form to sign before the interview began.

### *Participant Characteristics*

All 10 parent(s) of the sibling dyads participating in the present study were biological mothers of both children. The sibling dyads consisted of 10 children from the CLS who had asthma, and 10 of their siblings who did not have asthma. All of the children had English as their first language, and all of the children were living with their biological sibling/s and parent/s at time of study. Eight families had both parents living at home and two families had only one parent (mother) living at home. Nine families described themselves as NZ European and one from a minority group. The annual income of the families, \$20 000 - \$30 000 (two families); \$30 000- 50 000 (one family); \$50 000- \$70 000 (three families) and \$70 000+ (four families). This information was obtained from the CLS with parent's permission (see information letter and consent form, Appendix B).

The children who had asthma were aged between 6-8 years (mean age, six years eleven months) and the siblings in the study ranged from 4-11 years of age (mean age, six years, three months). There were 11 girls and 9 boys in the sample. There were five sets of siblings that were the same gender, two sets of boys and three sets of girls, and the other five sets of siblings were of the opposite gender. The birth order of the children with asthma within the sibling dyads, they were oldest in four of the sibling dyads, the youngest in four of the sibling dyads and the same age in the other two sibling dyads (two sets of twins).

### *Instrumentation*

The *Strengths and Difficulties Questionnaire* (SDQ; Goodman, 1997) is a brief behavioural questionnaire, for assessing the psychological adjustment of children and youth. Different versions of the SDQ can be completed by parents or teachers of 3-16 years olds and by 11-16 year olds themselves. The SDQ contains 25 questions (attributes), some positive and others

negative, with a 3-point Likert scale used for answering each question relating to the child's behaviour from the last six months, (not true, somewhat true and certainly true). The 25 items are divided between five scales, the Emotional Symptoms Scale, Conduct Problems Scale, Hyperactivity Scale, Peer Problems Scale and a Prosocial Scale (Table 1). There is also a Total Difficulties Score, which is calculated from adding all the subscale scores, except the Prosocial Scale score.

The SDQ functions correlates well with the *Child Behavior Checklist* (CBCL; Achenbach, 1991), with cross-informant correlations found to be higher than usual for questionnaires (Goodman et al., 1998). One study by Goodman and Scott (1999) found that correlations between internalizing and externalising scales were lower for the SDQ than for the *Child Behavior Checklist* (CBCL; Achenbach, 1991). "This finding raises the possibility that the SDQ scales were 'purer' and less 'contaminated' by one another" (Goodman, 2001). The same study found that with the parent report, the SDQ was significantly better at detecting hyperactivity and inattention in children than the CBCL, and with the SDQ at least as good at finding internalizing and externalizing behaviour problems (Goodman & Scott, 1999).

A study by Goodman (2001) to investigate the psychometric properties of the SDQ, was carried out in Britain, with a total sample of 10,438 children. The findings of this study were that the SDQ had good psychometric (reliability and validity) properties. Reliability was good, with an internal consistency of (mean Cronbach alpha 0.73), cross-informant correlation (mean 0.34), and retest stability after 4-6 months (mean 0.62). The internalizing and externalizing scales had little overlap, indicating that the scales were relatively "uncontaminated" by one another as suggested by (Goodman & Scott, 1999). The SDQ scores above the 90<sup>th</sup> percentile predicted a large probability of psychiatric disorders being independently diagnosed (means odds ratio: 15.7

for parent scales, 15.2 for teacher scales and 6.2 for youth scales). Overall, the psychometric properties (reliability and validity) of the SDQ make it a very useful questionnaire for measuring behavioural problems and psychological adjustment in children and adolescents (Goodman, 2001).

Australian norms for the SDQ for children aged 4-9 years (Hawes & Dadds, 2004), and for children aged 7-17 years (Mellor, 2005) were considered. However, in the current study the ages of the children ranged from 4-11 years, so United Kingdom norms were used in the analysis of the data. Calam, Gregg and Goodman (2005) used the SDQ because of its good psychometric properties, to measure behaviour problems and psychiatric diagnoses in a sample of 10,438 children with and without asthma, aged between 5- 15 years.

Functional asthma severity was calculated from questions in the parent interview that were from the CLS. These questions had been adapted from the standardized questions of the *Asthma Functional Severity Scale* (AFSS; Rosier, Bishop, Nolan, Robertson, Carlin & Phelan, 1994). The AFSS is a parent report, six-item questionnaire measuring the functional aspects of asthma severity among children aged 8-16 years. The questionnaire items measure four components of functional asthma severity; 1) the frequency of asthmatic episodes; 2) the airway restriction symptoms between such episodes; 3) the extent of impairment during asthma attacks and the impact of airway; 4) restriction on the child's daily functioning between episodes (Rosier, et al., 1994). A 4-point scale is used to attribute a degree of functional severity to each of the four measured domains, with lower scores suggesting milder functional asthma severity than higher scores. The psychometric properties of the AFSS were analyzed using 9,192 Australian children aged between 8-16 years. The scale showed good reliability and validity (Cronbach's  $\alpha=0.89$ ). The applicable age range of the questionnaire was not clearly specified by the authors but

Rutishauser, Sawyer and Bowes (1998) interpret Rosier et al. (1994) relevant age range specification of “school age” to include children between 5-15 years old.

Differences between the original AFSS and the adapted one used in the CLS and this study are included in Appendix C. Using the adapted AFSS, functional asthma severity scores were calculated without the need for physical exams, technical lung function tests or blood tests. A functional asthma severity score calculated for each of the 10 children in this study was that their parent described their child as having asthma. The overall functional asthma severity scores ranged between 0-24. Bands of asthma severity range from low (0-4), mild (5-8), moderate (9-14) and severe (15-24).

List 1. *Strengths and Difficulties Questionnaire (SDQ)* (Goodman, 1997)

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1. (ps) Is considerate of other people's feelings
2. (h) Is restless, overactive, cannot stay still for long.
- 3.(e) Often complains of headaches, stomach-aches or sickness (not related to asthma)
4. (ps) Shares readily with other children (treats, toys, pencils etc.)
5. (c) Often has temper tantrums or hot tempers
6. (pp) Rather solitary, tends to play alone
7. (c) Generally obedient, usually does what adults request
8. (e) Has many worries, often seems worried
9. (ps) Helpful if someone is hurt, upset or feeling ill
10. (h) Constantly fidgeting or squirming
11. (pp) Has at least one good friend
12. (c) Often fights with other children or bullies them
13. (e) Often unhappy, down-hearted or tearful
14. (pp) Generally liked by other children
15. (h) Easily distracted, concentration wanders
16. (e) Nervous or clingy in new situations, easily loses confidence
17. (ps) Kind to younger children
- 18.(c) Often lies or cheats
19. (pp) Picked on or bullied by other children
20. (ps) Often volunteers to help others (parents, teachers, other children)
21. (h) Thinks things out before acting
22. (c) Steals from home, school or elsewhere
23. (pp) Gets on better with adults than with other children
24. (e) Many fears, easily scared
25. (h) Sees tasks through to the end, good attention span

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( ) Indicates items on the:

(e) = Emotional Symptoms Scale

(ps) = Prosocial Scale (c) = Conduct Problems Scale

(pp) = Peer Problems Scale

(h) = Hyperactivity Scale

### *Procedure*

Ten parents were interviewed by the researcher at home or by telephone and were asked the questions from the SDQ for their child that has asthma. The parents were also asked questions on their child's general health and asthma severity. Following this, there were questions about the family environment that is, routines, if a parent smoked, family stress, and the number and types of pets if any. These questions were used mainly as distracters and for gathering extra information on the family. These questions were given at the break between the SDQ questions for the child with asthma and then their sibling without asthma. The distractor questions were used at that time so that the parent would not have to answer the SDQ questions about their other child immediately. As doing so there was the possibility of the parent recalling the answers they gave for their child with asthma, and this could bias the answers they gave for their child without asthma.

The final part of the interview was asking the parent the SDQ questions for their child without asthma. Questions then occurred on that child's general health, followed by any questions that the parent may have about the study (Appendix D). The entire interview (for both telephone and home interview) took approximately 30 minutes.

### *Data summarisation*

The standard protocols for scoring each question were used. A score of 0 was given for 'not true' and a 1 was given for 'sometimes true' and a 2 was given for 'certainly true' for each item on the SDQ, except for five items that received scores of 0 for 'certainly true', 1 for 'sometimes true' and 0 for 'not true', these were items The standard protocols for scoring each question were used. A score of 0 was given for 'not true' and a 1 was given for 'sometimes true' and a 2 was given for 'certainly true' for each item on the SDQ, except for five items. These items were: generally obedient, thinks things out before acting; sees task through to the end,

good attention span; has at least one good friend; and generally liked by other children, these items received scores of 0 for 'certainly true', 1 for 'sometimes true' and 2 for 'not true'. The scores for each member of the participating dyads were entered into a database for analysis. The item scores were totalled for each of the scales, and also for the overall Total Difficulties score (See results). Additionally the current study also analysed data collected previously from the 5- and 6-year-old parent interviews from the Children's Learning Study. The information from the interviews used in the current study also included demographic information, such as ethnicity, family income and gender of parents.

Scores were then categorised into 'normal', or 'borderline-clinical/abnormal'.

Then collation and statistical analysis of the data were performed using the *Statistical Package for Social Sciences* (SPSS). The data were analysed using a chi-square method for matched pairs (child with asthma and his/her sibling). A Pearson's chi-squared ( $\chi^2$ ) *p* value of < 0.05 was taken to indicate statistical significance. Pearson's *r* correlations were also determined, as discussed in the Results chapter.

## CHAPTER 4

### RESULTS

The data was collected over a four-week period from ten families. The data was collected by either telephone or visiting the homes of the families. No problems were experienced in collecting the data. The data were analysed using a chi-square method for matched pairs (child with asthma and his/her sibling). The results for the Strengths and Difficulties Questionnaire are presented first.

#### *The Total Difficulties Score*

The mean for the Total Difficulties Score for the children with asthma was 11.20, range (4-20, SD = 5.22), and for the siblings the mean was 9.70, range (3-20, SD = 5.79), these were not significantly different ( $F = .370, p = .551$ ). Although of the 10 pairs, the children with asthma from each pair had the highest score in eight of the 10 pairs.

The Total Difficulties Score is the total of the subscale scores (Emotional Symptoms, Hyperactivity, Conduct Problems, Peer Problems) with the exclusion of the Prosocial Scale score. A total score of 14 or greater is considered to show borderline clinical levels of difficulties and a score of 17 or greater represents an “abnormal” level of problem behaviours (Goodman, 1997). The Total Difficulties Score of each child was classified as below 14 normal behaviour and 14 or above was classed as borderline/abnormal levels of behaviour. The sibling pairs were matched and the matched pair analysis is shown in Table 1.

The Pearson Chi Square analysis (95% CI) shows no significance ( $\chi^2 = 1.406, p = .236$ ). The odds ration did not reach significance ( $p = .378$ ). The matched pair analysis shows that eight

sibling pairs had the same classification of behaviour (>14 or ≤14).within the sibling pair (80%).

Two pairs showed different behaviour outcomes to each other within the pair (20%).

Table 1  
Cross-Tabulation of Matched-Pairs and Total Difficulties Score

		Children with Asthma		Chi-Square	Phi
		>14	≤14		
Siblings	≤14				
without		1 pairs	1 pairs	1.406	0.375
Asthma	≤14				
		1 pairs	7 pairs		

### *Hyperactivity Scale*

The mean total for the Hyperactivity Scale for the children with asthma was 5.10 range (0-10, SD = 3.51) and for the siblings, the mean was 3.50 range (0-7, SD = 2.506), these are not significantly different ( $F = 1.376, p = .256$ ). A total score of 6 or greater in the Hyperactivity Scale is considered to show borderline clinical levels, and a score of 7 or greater, represents an “abnormal” level of problem behaviours (Goodman, 1997). The Hyperactivity Scale scores of each child were classified as below six is normal behaviour and 6 or above is borderline/abnormal behaviour. Four children with asthma had borderline/abnormal hyperactivity problems, and three children without asthma had hyperactivity problems. The matched pair analysis is shown in Table 2. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 0.079, p = 0.778$ ) and the odds ratio did not reach significance ( $p = 1.000$ ).

Table 2  
Cross-Tabulation of Matched-Pairs and Hyperactivity Scale Score

		Children with Asthma		Chi-Square	Phi
		>6	≤6		
Siblings	>6				
without		1 pairs	2 pairs	1.376	0.089
Asthma	≤6	3 pairs	4 pairs		

### *Emotional Symptoms Scale*

The mean total for the Emotional Symptoms Scale for the children with asthma was 2.90 range (0-9, SD = 2.514) and for the siblings, the mean was 3.0 range (0-6, SD = 1.944), these were not significantly different ( $F = 0.010, p = .922$ ). A total score of 4 or greater in the Emotional Symptoms Scale is considered to show borderline clinical levels, and a score of 5 or greater, represents an “abnormal” level of problem behaviours (Goodman, 1997). The matched pair analysis is shown in Table 3. Seven sibling pairs (70%) had similar emotional behaviour scores to each other within the pair, and three sibling pairs (30%) had different emotional behaviours (normal or borderline/ abnormal) classifications. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 1.270, p = 0.260$ ). The odds ratio did not reach significance ( $p = 0.500$ ).

Table 3

Cross-Tabulation of Matched-Pairs and Emotional Symptoms Scale Scores

		Children with Asthma		Chi-Square	Phi
		>4	≤4		
Siblings	>4				
without		2 pairs	2 pairs	1.270	0.356
Asthma	≤4				
		1 pairs	5 pairs		

*Peer Problems Scale*

The mean score for the Peer Problems Scale for the children with asthma was 0.60, range (0-3, SD = 1.075) and for the siblings, the mean was 1.80, range (0-4, SD = 1.619), and these were not significantly different ( $F = 3.812, p = 0.067$ ). A total score of 3 or greater is considered to show borderline clinical levels, and a score of 4 or greater, represents an “abnormal” level of problem behaviours (Goodman, 1997). The Peer Problems scale scores of each participant were classified as normal or borderline/abnormal. The matched pair analysis is shown in Table 4. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 1.667, p = 0.197$ ). The odds ratio did not reach significance ( $p = 0.400$ ). Seven sibling pairs (70%) had similar peer-problem behaviour scores to each other, and three sibling pairs (30%) had different peer-problem scale scores to each other.

Table 4  
Cross-Tabulation of Matched-Pairs and Peer Problems Scale Scores

		Children with Asthma		Chi-Square	Phi
		>3	≤3		
Siblings	>3				
without		1 pairs	3 pairs	1.667	0.408
Asthma	≤3				
		0 pairs	6 pairs		

*Conduct Problems Scale*

The mean score for the Conduct Problems Scale for the children with asthma was 2.60, range (1-5, SD 1.350) and for the siblings the mean was 1.40, range (0-5, SD = 1.647), and these were not significantly different ( $F = 3.176, p = 0.092$ ). A total score of 3 or greater is considered to show borderline clinical levels, and a score of 4 or greater, represents an “abnormal” level of problem behaviours (Goodman, 1997). The Conduct Problems Scale scores of each participant were classified as normal or borderline/abnormal. Six of the ten children with asthma were in the borderline/abnormal clinical range for conduct problems (60%), and two children without asthma were in the borderline/abnormal range (20%). The matched pair analysis is shown in Table 5. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 0.104, p = 0.747$ ). The odds ratio did not reach significance ( $p = 1.000$ ).

Table 5  
Cross-Tabulation of Matched-Pairs and Conduct Problems Scale Scores

		Children with Asthma		Chi-Square	Phi
		>3	≤3		
Siblings	>3				
without		3 pairs	0 pairs	0.104	0.327
Asthma	≤3				
		5 pairs	2 pairs		

*Prosocial Scale*

The mean score for the Prosocial Scale for the children with asthma was 8.30, range (6-10, SD = 1.160) and for the siblings, the mean was 8.10, range (5-10, SD = 2.132), and these were not significantly different ( $F = 0.068, p = 0.797$ ). A total score of 5 or less is considered to show borderline clinical levels, and a score of 4 or less, represents an “abnormal” level of problem behaviours (Goodman, 1997). Two children without asthma were in the borderline/abnormal range for having social problems, and all the children with asthma were in the normal range. The Prosocial Scale scores of each participant of each participant were classified as normal or borderline/abnormal. The matched pair analysis is shown in Table 6. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 0.123, p = 0.725$ ). The odds ratio did not reach significance ( $p = 1.000$ ).

Table 6  
Cross-Tabulation of Matched-Pairs and Prosocial Scale Scores

		Children with Asthma		Chi-Square	Phi
		≤ 5	> 5		
Siblings without Asthma	≤ 5	0 pairs	1 pairs	0.123	0.111
	> 5	1 pairs	8 pairs		

### *Behaviour Differences and Individual Items of the SDQ*

All 25 items from the SDQ were individually analysed, the individual item scores were correlated with the presence of asthma. From these results, the following items are mentioned as they correlated at the significant level, or very close to.

### *Tantrums*

The children with asthma as a group, were significantly more likely to have tantrums than children without asthma,  $r = 0.503$  ( $p = 0.02$ ), (Pearson correlation is significant at the 0.05 level (2-tailed). In the cross tab it was found that eight (80%) children with asthma had temper tantrums or hot tempers compared to three (30%) children without asthma. Of the sibling pairs, three pairs both had tantrums, two pairs neither had tantrums, and five pairs the child with asthma had tantrums and the sibling without asthma did not. The matched pair analysis is shown in Table 7. Pearson Chi Square analysis (95% CI) shows no significance ( $\chi^2 = 0.901$ ,  $p = 0.343$ ). The odd ratio did not reach significance ( $p = 1.05$ ).

Table 7

Cross-Tabulation of Matched-Pairs and Tantrums

		Children with Asthma		Chi-Square	Phi
		Tantrums	No Tantrums		
Siblings without Asthma	Tantrums	3 pairs	0 pairs	0.901	0.500
	No tantrums	5 pairs	2 pairs		

*Attention span*

All of the children that did not have asthma were rated by their mothers as having a good attention span and seeing tasks through to the end. The children with asthma, had more maternal reports of attention problems than children without asthma, and this was close to significance  $r = 0.420$  ( $p = 0.065$ ), (Pearson correlation is significant at the 0.05 level (2-tailed)). Three children (30%) with asthma were rated as not having good attention span/see task through to the end. The matched pair analysis is shown in Table 8. Pearson Chi Square analysis (95% CI) was close to significance ( $\chi^2 = 0.420$ ,  $p = 0.06$ ). The odd ratio did not reach significance ( $p = 0.26$ ).

Table 8

Cross-Tabulation of Matched-Pairs and Attention

		Children with Asthma -		Chi-Square	Phi
		Good Attention			
		Yes	No		
Siblings without Asthma -	Yes	7 pairs	0 pairs	0.420	0.167
	No	3 pairs	0 pairs		

\* (0.5 added to each cell, as two cells contained zero and a calculation could not be made, these are therefore approximate values).

*Friends*

Parents rated the item ‘has at least one good friend’ as somewhat or certainly true for all children with asthma (100%), and not true for two children without asthma (20%). The children with no asthma as a group, were significantly more likely to have no close friends than children without asthma, ( $r = -0.47, p = 0.037$ ), (Pearson correlation is significant at the 0.05 level (2-tailed)). The matched pair analysis is shown in Table 9. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 0.364, p = 0.5$ ). The odd ratio did not reach significance ( $p = 0.25$ ).

Table 9  
Cross-Tabulation of Matched-Pairs and Friends

		Children with Asthma -		Chi-Square	Phi
		Has at least one good friend			
		Yes	No		
Siblings without Asthma -	Yes	8 pairs	0 pairs	0.364*	0.174*
Has at Least one good friend	No	2 pairs	0 pairs		

\* (0.5 added to each cell, as two cells contained zero and a calculation could not be made, these are therefore approximate values).

No other specific behavioural differences (individual items on the SDQ) between children with asthma and their siblings without asthma were found at the significant level ( $p \leq 0.05$ ). No

other matched pairs for individual items of the SDQ and sibling pairs were found at the significant level.

#### *Asthma severity and medication*

The Rosier Severity Scores for the children with asthma were correlated with the Total Difficulties Score (SDQ), There was no correlation found at the significant level,  $r = 0.118$ , ( $p=0.75$ ). The five scale scores from the SDQ were also not significantly correlated to asthma severity. Of the three children with asthma that were in the borderline/abnormal range for the total difficulties score, one child had low asthma severity and the other two were in the severe asthma range.

All children with asthma were taking asthma medication. Seven children used both a preventer and a reliever as required, and the other three children with asthma took only reliever medication as required. A bivariate correlation was conducted to investigate whether there was a relationship between children's behavioural scores and the medication they were using. For the total difficulties score, medication type was found to be significantly correlated,  $r = 0.81$  ( $p=0.004$ ). The children that were having reliever medication without a preventer all were in the borderline/abnormal level for total difficulties.

As well, the same children that took only reliever medication all had borderline/abnormal levels in the hyperactivity scale, this too was at the significant level ( $p=0.005$ ). Two of the children that were taking only reliever medication, were in the borderline/abnormal levels for emotional and conduct problems, however this was not at a significant level. For the children that took only reliever medication, two of them were in the severe band for functional asthma severity.

### Gender Differences

No significant difference was found for having borderline/abnormal levels of total behaviour problems in regards to gender. Three girls scored in the borderline/abnormal level for total difficulties, with only one boy scoring in the borderline/abnormal level. The matched pair analysis is shown in Table 10 and Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 3.214, p = 0.07$ ). The odds ratio did not reach significance ( $p = 0.17$ ). The sibling pairs of the same gender, all shared the same behavioural construct, either each pair were both in the normal range, or each pair were both in the borderline/abnormal range for total difficulties. Girls were more likely to have conduct problems than boys, with 5 girls rated as having conduct problems, and three boys rated as having conduct problems. There were four boys that were in the borderline/abnormal range for hyperactivity problems compared with three girls in this range.

Table 10  
Cross-Tabulation of Matched-Pairs and Gender

Gender	Same Gender	Behaviour- normal or borderline/abnormal		Chi- Square	Phi
		Same Behaviour	Different Behaviour		
		5 pairs	0 pairs	3.210	0.655
	Different Gender	2 pairs	3 pairs		

*Socioeconomic Status*

Socioeconomic status (SES) was adjusted, below \$50,000 became medium/low SES and above \$50,000 became high SES. Statistics New Zealand puts the average household income at \$67,973 per year and the average weekly income per person is \$537 (Statistics New Zealand, 2007). The matched pair analysis is shown in Table 11. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 2.86, p = 0.09$ ). The odds ratio did not reach significance ( $p = 0.20$ ). No pairs of the children in the medium/low SES group were rated as the same for total difficulties. The sibling pairs from the higher SES, were more likely to be rated the same for behaviour, with four pairs rated as either both in the normal range for total difficulties, or both in the borderline/abnormal range for total difficulties.

Table 11

Cross-Tabulation of Matched-Pairs and Socioeconomic Status

		Normal or borderline/abnormal behaviour		Chi- Square	Phi
		Same Behaviour	Different Behaviour		
Socioeconomic Status (SES)	Medium/Low SES	0 pairs	3 pairs	2.860	0.535
	High SES	4 pairs	3 pairs		

### Health

None of the 20 children were rated as being in poor health. All children were parent-rated as being in fair to excellent health, with two children rated as fair, four children as in good health, eight children as very good health, and six children as excellent health. The matched pair analysis is shown in Table 12. Pearson Chi Square analysis (95% CI) show no significance ( $\chi^2 = 0.104$   $p = 0.75$ ). The odd ratio did not reach significance ( $p = 1.00$ ). The matched pair analysis is shown in Table 12. Eight pairs of children (80%) had were in the same behaviour range regardless of health status.

Table 12  
Cross-Tabulation of Matched-Pairs and Health

		Behaviour- Range of		Chi-Square	Phi
		Total Difficulties			
		Same	Different		
Overall	Same				
Health Status		5 pairs	1 pairs	0.104	0.102
	Different				
		3 pairs	1 pairs		

## CHAPTER 5

### DISCUSSION

The aim of the current study was to investigate whether children with asthma have more behaviour problems compared to children without asthma (McQuaid, Kopel & Nassau, 2001), and if children with asthma have more or different behaviour problems than their siblings who do not have asthma. Behavioural problems in children with asthma have been suggested to be caused by asthma severity, overall health status, SES, medication, genetics, family stress, maternal depression/distress or a combination of these factors. They are also considered to be risk factors for asthma. From the existing literature, children who have asthma are more likely to have behavioural problems compared to children that do not have asthma. McQuaid et al. (2001) reported children with asthma having increases of behavioural problems one-half to two-thirds of a standard deviation relative to children without asthma. However, in this study there were no differences found for total difficulties scores or in the subscale scores for the children with and the children without asthma. However, for the individual items on the SDQ there were some differences found.

#### *Findings and interpretation of results*

The children with asthma had higher scores for behavioural problems than did the children without asthma, although this was not to the significant level. The mean score of Total Difficulties for children with asthma was 11.20 compared to 9.70 for the children without asthma. In the 10 sibling pairs, eight of the children with asthma had the highest total difficulties scores compared to their siblings without asthma. In the matched pair analysis, the sibling dyads were 80% more likely to be similar to each other in their behaviours than not. The children with

asthma did have higher scores for hyperactivity problems, emotional symptoms and conduct problems than did the children without asthma but not to a significant level. However, the siblings, the children without asthma had more peer-problems than the children that did have asthma.

For individual behaviour items on the SDQ, there were differences found. Children with asthma were more likely to have tantrums (80%) than were their siblings without asthma (30%), ( $p=0.02$ ). This corresponds with the findings of Liberty and Edgin (2004) with tantrums occurring more in the children with asthma in their study. In their study tantrums occurred in 12.5% of children with asthma, compared with 4.2% of children without asthma. Another finding from the results of the current study was that for the children without asthma that had tantrums, all had a brother or sister with asthma that had tantrums as well. This may suggest that the risk factors for tantrums may be asthma or having a sibling with asthma.

The item for attention problems was found to be close to significance ( $p=0.06$ ) in the Pearson Chi Square analysis, children with asthma had more attention problems, compared with the children without asthma. In the matched pair analysis, the majority of sibling pairs (70%) had no problems with attention. All of the siblings who did not have asthma, had good attention spans and saw tasks through to the end, compared to 30% of the children with asthma that had problems with attention.

The children without asthma were more likely not to have at least one good friend, whereas all the children with asthma had at least one good friend. Barlow and Ellard (2006) in their review found that children with a brother or sister with a chronic illness were 25% more likely to have behavioural problems. However, these were not the findings in this study and Barlow and Ellard (2006) did not include any studies on the siblings of children with asthma.

Asthma severity was unrelated to behaviour problems in this study. The three children with asthma who were in the abnormal range for total behavioural difficulties had different levels of asthma severity. One of the children had low asthma severity, while the other children were in the severe asthma range, and none of these children used preventer medication for asthma but did use reliever medication when required.

All the children with asthma in this study used asthma medication, 70% of them used a preventer and a reliever and the other 30% used only a reliever medication when required. The types of medications used were highly correlated with behaviour problems ( $p=0.004$ ). All the children (30%) that used a reliever but did not use a preventer were in the borderline/abnormal clinical level for total behaviour problems as mentioned above. Additionally, these children (that did not use preventers) had more hyperactivity problems ( $p=0.005$ ) compared to the children with asthma that took both preventer and reliever medication the children with asthma all took medication for their asthma symptoms. This finding could be due to children taking preventer medication having less asthma symptoms as their symptoms are managed more effectively. Therefore, this could mean that the more asthma symptoms a child has corresponds to increased behaviour problems. As well, the more effective the asthma is managed the lower the asthma severity in the child.

Although gender corresponds to different behaviour problems in children (Carr, 1999), there were no significant differences found in this study in regards to gender and behaviour outcome. However, there was a trend for girls to have higher scores for conduct problems compared with the boys in this study. This finding is inconsistent with the prevalence rates in the literature, as boys generally have higher rates of conduct problems than do girls (Church, 2003). The reason for the girls in this study to have higher rates of conduct problems is not known.

Additionally in the mixed pair analysis, siblings of the same gender were more likely to have similar behaviours (50%), compared with the siblings of mixed genders (30%).

All of the children were in fair to excellent health. In the matched pair analysis, children who were rated as being in the same health category were more likely to be in the same behaviour range (normal or borderline/abnormal) to each other. Calam et al. (2005) found that children were more likely to have behaviour problems if they were in poor health, regardless of asthma presence or not. As there were no children in this study with poor health (excluding asthma), comparisons to the literature could not be made, for poor health and behaviour problems.

There was no difference found in the number of behaviour problems for the children with asthma compared to their siblings without asthma, so this meant that SES was also not related to asthma in this study as the sibling pairs were from the same household and therefore shared the same socioeconomic status. However, the findings showed that children were more likely to be similar in their behaviours with their sibling if they came from medium to high SES (40%) than from low/medium SES (0%).

This finding suggests that it may be risk factors in the environment that cause behaviour problems rather than asthma. Some of the factors influencing behaviour problems in these children could be higher rates of stress within high, medium and low SES families with a child with asthma and this could lead to increased parenting problems for all children within the family. The children taking preventer medication for asthma had less behavioural problems, it could be that their parent/s were more cautious and therefore ensured that their child was adhering to the correct medication.

Implications of the findings of this study are that as the siblings were more similar in behaviour to children with asthma it is possible that it was not the asthma that was related to the behaviour problems, but another factor or factors. The siblings share the same home environment and it could be a factor within the home or something else in the environment protecting against behaviour problems in these children. It may be parenting, genetics, stress or a combination of these and other factors that contribute to similar behaviours between the children with asthma and the siblings without asthma. However, this raises the question of asthma not being a moderator in behaviour problems and the possibility that the home environment may be the cause of the behaviour problems in some of the children but it may also trigger asthma in some at-risk children, or for other children the home environment may well be a protective factor against behaviour problems.

#### *Limitations of the study*

Results of this study must be considered in light of its limitations. The main limitation of this study was the small sample size. Sample size influences the statistical power of an analysis, statistical power relates to the sensitivity of a statistical test or the ability to detect relationships between variables. Generally, statistical power increases with sample size. Some of the non-statistical results found in this study may have been due to the limited statistical power in the study rather than a lack of meaningful differences between the children with asthma and their brothers and sisters without asthma. Small sample sizes lack statistical power and precision, and some statistical tests tend to show meaningful effect sizes as non-significant. Some of the results found were close to significance and with a larger sample size these could have been significant and stronger conclusions could have been made.

A further limitation of this study was the parent-reported measures to identify behaviour problems. Parents of children with asthma may not be reliable in their reporting of behaviour problems in their own children. Having a child with asthma can add extra stress to some parents, and they, therefore, can tend to over report behaviour problems. This has been reported for mothers with depression who have been found to over report behaviour problems in their children (Korzyrskyj et al., 2008). Studies that have relied on parental ratings have also been found that more behaviour problems were reported in children than studies that used multi-informants (Barlow & Ellard, 2006). Only parental report was used in this study. Teachers, were considered for this study, but could not be used as some of the children were not of school age. Correlation between parent and teacher ratings on behavioural questionnaires is often low, as is test-retest reliability (ref). The lack of reliability probably occurs from the differences in the interpretations of category definitions, different attitudes towards the child and individual levels of tolerance for problem behaviour.

Another methodological limitation was the use of checklists to measure behaviour problems. Most checklists have a 3-5 likert scale (SDQ has a 3 point scale) and are therefore limited in their capacity to assess the frequency of occurrence of any given behaviour. The behaviour of two children might be similar, but one child may display the behaviour 15 times a day, whereas the other child may only display the behaviour once a day. Therefore, from a checklist both children can be rated as having the same behaviour problem/s, but the frequency of the behaviour/s could vary considerably (ref).

Finally, the findings of this study may have been limited due to the population sample of this study. Children living with two biological parents whose family income fell in the medium to high income bracket were over-represented in the study sample, while children living with one

biological parent whose income was low compared to the average wage were under-represented. Minority groups were under-represented in this group and Māori children were not represented at all in the study sample. Therefore, the children in this study are not an accurate representation of the New Zealand population.

#### *Strengths of the study*

A methodological strength of this study was the use of the *Strengths and Difficulties Questionnaire* (SDQ) as a measure of behaviour problems in children as it only has one item relating to health, which can be pro-rated when scoring the results. Additionally the SDQ informant-rated (parent/teacher) questionnaire is able to be used to measure children from age 3 - 16 years, which meant it was ideal for this study as the siblings of the children with asthma ranged in age from 4-11 years.

A further strength of this study was that in using sibling dyads, many environmental factors could be controlled for between pairs, such as, SES, parenting style, maternal psychopathology, household routines and conflict. Of the studies in the literature on children with disabilities and/or chronic illness and siblings, none of these studies identified or reported on asthma in children and their siblings who do not have asthma. Moreover, there are no studies identifying behaviour problems in children with asthma and using their siblings who do not have asthma. This current investigation/analysis of the siblings with asthma is a strength and this study raises many variables/questions for further investigation.

#### *Implications for practice*

The findings of the current study for practice are very limited given the small sample size. However, support for families of children with asthma needs to be considered when diagnosing a child with asthma or working with a family with a child with asthma. Kibby, Tyc and Mulhern

(1998) found psychological interventions for disease management and behavioural problems to be effective for children with a chronic illness. Family systems are often a complex set of relationships and more so when a child in the family has a chronic illness. Families may adapt to having a child with a chronic illness, as in, care-giving, stress and anxiety. Professionals working with families that have a child with asthma should be aware that the other children in the family could be at risk for behaviour problems as well. Future research should explore the effectiveness of interventions that assist the brothers and sisters of children with asthma as well as assisting children with asthma.

#### *Suggestions for further research*

The lack of information on siblings of children with asthma needs to be researched further. This would be beneficial to understanding further the possible link between asthma and behavioural problems in children. Larger sample sizes would be beneficial, and participants should be from a varied population, such as children from low to high SES, and children of differing ethnicities to represent the general population. Additionally, the use of multi-informant reports, such as teacher reports and self-reports for older children as well as parental reports could be more reliable in investigating behaviour problems in children with asthma and their siblings without asthma.

Future studies could also include a measure for maternal depression, parenting styles and family stress. These measures may help further in identifying the risk factors for behaviour problems in children with asthma and their siblings and possible protective factors that can reduce behaviour problems in these children.

### *Conclusion*

This study found that children with asthma were more likely to be similar to their siblings without asthma in their behaviour. As the sibling pairs shared the same environmental factors and shared similar behaviour then it is possible that asthma itself is not the main factor for this effect. The factors influencing behaviour problems in the sibling dyads are unclear, but it is possible they are environmental. Further research is needed using a larger sample size and additional measures to investigate this further. This study raised questions, and although the sample size precludes firm conclusions, it was found that children with asthma have more tantrums and behaviour seems to be influenced by the type of asthma medication used.

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**University of Canterbury**  
School of Educational Studies and Human Development  
Letterhead

## Parent Information Sheet

### Date

Dear \_\_\_\_\_,

My name is Stephanie Beynon, and I am completing a small research project as part of my Masters of Education degree (M.Ed). The reason why I am contacting you is because you were involved in the Children's Learning Study and I am hoping that you will be involved in my project as it relates to children with asthma their siblings without asthma, and their behaviour.

Your participation in this project would involve a short interview. I will ask a set of questions focussing on the behaviour of (name of child) who has asthma and their (brother/sister) who does not have asthma. For example, how they play with other children, listen to adult requests, and the activities they enjoy.

The interview will take about 30 minutes and can be at a time and place that suits you; either at your home, by phone, or at the university. In addition, some information that you have already given in the Children's Learning Study will be used in this project, such as your marital status, age, education and family size.

The project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and all the information gathered will be kept confidential; your name and your children's names will not be in my final report. Your involvement is voluntary and you may withdraw from the project at any time. As a small thank you will receive a \$10 grocery voucher.

Thank you for taking the time to consider my request. I will contact you by phone in the next 3 days to discuss your possible participation in my project. Please do not hesitate to contact me, or my supervisor before then if you have any queries or wish to know more about my project.

Kind regards,

**Stephanie Beynon**  
Masters Student  
Phone: 021 151 5082  
[Sbe16@student.canterbury.ac.nz](mailto:Sbe16@student.canterbury.ac.nz)

Dr Kathleen Liberty  
Project Supervisor  
Phone: (03) 364 2545  
[kathleen.liberty@canterbury.ac.nz](mailto:kathleen.liberty@canterbury.ac.nz)

**University of Canterbury**

School of Educational Studies and Human Development

**Parent Consent Form**

I have read and understood the information form. I have been given the opportunity to ask the researcher any questions about the project.

I understand the study will be written up in the form of a report and submitted for marking at the University of Canterbury as part of a MEd dissertation.

I understand that information I have given to The Children's Learning Study will be used in this project and that information I give will be shared with the Children's Learning Study.

I understand all information will be confidential and that my name and my children's names will not appear in any report.

I understand also that I may at any time withdraw from the project, including any information I have provided.

I am willing to be interviewed for this project, and I understand I do not have to answer any question/s if I choose

**YES/NO**

NAME (please print): .....

Signature:

Date:

Stephanie Beynon  
Masters Student  
Ph: 021 151 5082  
E-mail: [sbe16@student.canterbury.ac.nz](mailto:sbe16@student.canterbury.ac.nz)

Dr Kathleen Liberty  
Project Supervisor  
Ph: (03) 36402545  
[Kathleen.liberty@canterbury.ac.nz](mailto:Kathleen.liberty@canterbury.ac.nz)

<b>Appendix C</b> Asthma Functional Severity Scale
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<i>Asthma Functional Severity Scale (Rosier et. al., 1994)</i>	<i>Adaptation of the Asthma Severity Scale from CLS Items</i>																																										
<p><b>(1).</b> Some children have episodes only from time to time, and feel well between episodes. Other children, however, may feel wheezy or tight in the chest on most days, but also suffer from more severe episodes of asthma. In the last 12 months, how often did your child have episodes of wheezing, or wheezing which was more troublesome than usual?</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Never</td><td style="text-align: right;">0</td></tr> <tr><td>Less than monthly</td><td style="text-align: right;">1</td></tr> <tr><td>Monthly</td><td style="text-align: right;">2</td></tr> <tr><td>Weekly</td><td style="text-align: right;">3</td></tr> <tr><td>Daily</td><td style="text-align: right;">4</td></tr> <tr><td>Don't know</td><td style="text-align: right;">5</td></tr> </table> <p><b>(2).</b> In the last 12 months, how often did your child wake at night with cough or wheezing?</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Never</td><td style="text-align: right;">0</td></tr> <tr><td>Only with episodes</td><td style="text-align: right;">1</td></tr> <tr><td>Less than 1 night/week</td><td style="text-align: right;">2</td></tr> <tr><td>1-3 nights/week</td><td style="text-align: right;">3</td></tr> <tr><td>Most nights</td><td style="text-align: right;">4</td></tr> <tr><td>Don't know</td><td style="text-align: right;">-</td></tr> </table>	Never	0	Less than monthly	1	Monthly	2	Weekly	3	Daily	4	Don't know	5	Never	0	Only with episodes	1	Less than 1 night/week	2	1-3 nights/week	3	Most nights	4	Don't know	-	<p><b>Item 1.</b> Frequency of wheeze attacks in the last 12 months?</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>None</td><td style="text-align: right;">0</td></tr> <tr><td>1 to 3</td><td style="text-align: right;">1</td></tr> <tr><td>4 to 12</td><td style="text-align: right;">2</td></tr> <tr><td>More than 12</td><td style="text-align: right;">4</td></tr> </table> <p><b>Item 2.</b> Frequency of disturbed sleep due to wheeze in the last 12 months</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Never</td><td style="text-align: right;">0</td></tr> <tr><td>Less than 1 night/month (Includes 1 night/3 and 6 months)</td><td style="text-align: right;">1</td></tr> <tr><td>Less than 1 night/fortnight</td><td style="text-align: right;">2</td></tr> <tr><td>1-2 nights/week</td><td style="text-align: right;">3</td></tr> <tr><td>More than 3 nights/week (includes 3-5 nights, and most nights)</td><td style="text-align: right;">4</td></tr> </table>	None	0	1 to 3	1	4 to 12	2	More than 12	4	Never	0	Less than 1 night/month (Includes 1 night/3 and 6 months)	1	Less than 1 night/fortnight	2	1-2 nights/week	3	More than 3 nights/week (includes 3-5 nights, and most nights)	4
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<i>Asthma Functional Severity Scale (Rosier et. al., 1994)</i>	<i>Adaptation of the Asthma Severity Scale from CLS Items</i>
<p><b>3).</b> In the last 12 months, how often was your child's wheezing troublesome first thing in the morning?</p> <p>Never 0</p> <p>Only with episodes 1</p> <p>Less than 1 morning/week 2</p> <p>1-3 mornings/week 3</p> <p>Most mornings 4</p> <p>Don't know -</p>	<p><b>Item 3.</b> Frequency of morning wheeze and asthma symptoms</p> <p>Never 0</p> <p>1-2 per month 2</p> <p>1-2 per week 3</p> <p>Every day 4</p>
<p><b>(4).</b> In the last 12 months has your child had an attack which has been severe enough to limit speech to only one or two words at a time between breaths?</p> <p>No 0</p> <p>Yes 4</p> <p>Don't know -</p>	<p><b>Item 4.</b> Speech affected by wheeze</p> <p>Never 0</p> <p>Prior to last 12 months 1</p> <p>Affected in the last 12 months 2</p> <p>Limited to two words 4</p>

<i>Asthma Functional Severity Scale (Rosier et. al., 1994)</i>	<i>Adaptation of the Asthma Severity Scale from CLS Items</i>
<p><b>(5).</b> In the last 12 months, how often were your child's activities affected or limited by cough, wheeze or shortness of breath while he/she was at home or playing with other children?</p> <p>Never 0</p> <p>Less often than monthly 1</p> <p>Monthly 2</p> <p>Weekly 3</p> <p>Daily 4</p> <p>Don't know -</p>	<p><b>Item 5.</b> Wheeze during or following exercise</p> <p>Never 0</p> <p>Prior to last 12 months 2</p> <p>Affected in last 12 months 4</p>
<p><b>(6).</b> In the last 12 months, how often were your child's sporting* activities at school affected by or limited by cough, wheeze or shortness of breath?</p> <p>Never 0</p> <p>Less often than monthly 1</p> <p>Monthly 2</p> <p>Weekly 3</p> <p>Daily 4</p> <p>Don't know -</p>	<p><b>Item 6.</b> Symptoms triggered by exertion</p> <p>Rarely 0</p> <p>Exercise or sports 1</p> <p>Hills, stairs, active play 2</p> <p>Exercise/sports + hills/stairs 3</p> <p>Exercise/sports + hills/stairs + walking on the flat 4</p>
<p><b>TOTAL :</b> /24</p>	<p><b>TOTAL:</b> /24</p>

## Interview

Please give your answers on the basis of the child's behaviour over the last six months.

Parent's name: .....

Mother / Father

Child's Name: .....

Child's Age: .....

Asthma: Yes / No

Child's Gender: M/F

	<b>Not True</b>	<b>Somewhat True</b>	<b>Certainly True</b>
1. (ps) (child's name) is considerate of other people's feelings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. (h) (child's name) is restless, overactive, cannot stay still for long	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.(e)Often complains of headaches, stomach-aches or sickness – not related to asthma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.(ps) Shares readily with other children (treats, toys, pencils etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. (c) Often has temper tantrums or hot tempers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. (pp) Rather solitary, tends to play alone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. (c) Generally obedient, usually does what adults request	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. (e)(child's name) has many worries, often seems worried	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. (ps) Helpful if someone is hurt, upset or feeling ill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- |  |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|
| 10.(h) Constantly fidgeting or squirming                                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. (pp) Has at least one good friend  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. (c) Often fights with other children or bullies them                     | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. (e) Often unhappy, down-hearted or tearful                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. (pp) Generally liked by other children                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. (h) Easily distracted, concentration wanders                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. (e) Nervous or clingy in new situations, easily loses confidence         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17.(ps) Kind to younger children   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. (c) Often lies or cheats   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. (pp) Picked on or bullied by other children                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. (ps) Often volunteers to help others (parents, teachers, other children) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 21.(h) Thinks things out before acting                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 22. (c) Steals from home, school or elsewhere                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 23.(pp) Gets on better with adults than with other children                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 24. (e) Many fears, easily scared  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 25. (h) Sees tasks through to the end, good attention span                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

26. Overall, do you think that your child (child's name) has difficulties in one or more of the following areas: emotions, concentration, behaviour or being able to get on with other people?

- No
- Yes-minor difficulties
- Yes-definite difficulties
- Yes- severe difficulties

If **YES** to the above, ask these questions:

27. How long have these difficulties been present?

28. Do the difficulties upset or distress (your child)?

Not at all	Only a little	Quite a lot	A great deal
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29. Do the difficulties interfere with your child's everyday life in the following areas?

	Not at all	Only a little	Quite a lot	A great deal
a. Home life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Friendships	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Classroom learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Leisure activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. Do the difficulties put a burden on you or the family as a whole?

Not at all	Only a little	Quite a lot	A great deal
------------	---------------	-------------	--------------

(H) Would you say (CHILD'S NAME)'s health at the present time (in general) is excellent, very good, good, fair, or poor?

Excellent

Very good

Good

Fair

Poor

*Asthma status:*

A.1. How many attacks of wheezing has your child had in the past 12 months?

None

1-3

4-12

More than 12

A.2. How often on average has your child's sleep been disturbed due to wheezing in the last 12 months?

None

Less than 1 night/month

Less than 1 night/fortnight

1-2 nights/week

More than 3 nights/week

A.3. How often does your child have wheeze or asthma symptoms in the morning?  
(Tightness in chest, coughing, trouble breathing)

Never

1-2 per month

1-2 per week

Every day

A.4. Has wheezing been severe enough to limit your child's speech to only one or two words at a time between breaths. How often has their speech been limited to 1-2 words?

- Never
- Prior to last 12 months
- Affected in the last 12 months
- Limited to two words
- 

A.5. Does your child have wheeze during or following exercise?

- Never
- Prior to last 12 months
- Affected in the last 12 months

A. 6. Does your child have asthma symptoms (tightness in chest, coughing, trouble breathing) triggered by exertion, and what kind of activity/s cause this?

- Never
- Rarely
- Exercise or sports
- Hills, stairs, active play
- Exercise/sports and hills/stairs
- Exercise/sports and hills/stairs and walking on the flat

**Part 2 of Interview**

**For Questions with an asterisk ask the parent to answer with the number to the response that best represents their opinion (1-5):**

- 1=If you Strongly agree** with the statement
- 2=If you agree** with the statement
- 3=if you are not sure**
- 4=if you disagree** with the statement
- 5=if you strongly disagree** with the statement

1. Do you have pets in your home? If yes what type of animal/s. (Fiese, B. H. et al .2007)

Yes       No      Type/s.....

2. Does your child take asthma medication? What type and how often?

3. There is no disruption to your daily routine, because of your child's asthma symptoms

1            2            3            4            5

                                              

4. My children go to bed at the same time each night.

1            2            3            4            5

                                              

5. My children wake during the night.

1            2            3            4            5

6. My child's asthma symptoms cause no conflict in the home

1	2	3	4	5
<input type="checkbox"/>				

7. Does anyone smoke in your home? (whom, where, how often)

8. There is disruption to your daily routine, because of your child's asthma symptoms.

1	2	3	4	5
<input type="checkbox"/>				

9. We eat dinner together as a family

1	2	3	4	5
<input type="checkbox"/>				

10. What are your children's strengths?

### Part 3

Please give your answers on the basis of the child's behaviour over the last six months.

**Child's Name:** .....

**Child's Age:** .....

**Asthma: Yes / No**

**Child's Gender: M/F**

	<b>Not True</b>	<b>Somewhat True</b>	<b>Certainly True</b>
1. (ps) (child's name) is considerate of other people's feelings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. (h) (child's name) is restless, overactive, cannot stay still for long	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.(e)Often complains of headaches, stomach-aches or sickness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- |  |                          |                          |                          |
|--|--------------------------|--------------------------|--------------------------|
| 4.(ps) Shares readily with other children (treats, toys, pencils etc.) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. (c) Often has temper tantrums or hot tempers                        | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. (pp) Rather solitary, tends to play alone                           | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. (c) Generally obedient, usually does what adults request            | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. (e)(child's name) has many worries, often seems worried             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. (ps) Helpful if someone is hurt, upset or feeling ill               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10.(h) Constantly fidgeting or squirming                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. (pp) Has at least one good friend                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. (c) Often fights with other children or bullies them               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. (e) Often unhappy, down-hearted or tearful                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. (pp) Generally liked by other children                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. (h) Easily distracted, concentration wanders                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. (e) Nervous or clingy in new situations, easily loses confidence   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17.(ps) Kind to younger children                                       | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. (c) Often lies or cheats   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

19. (pp) Picked on or bullied by other children
20. (ps) Often volunteers to help others (parents, teachers, other children)
21. (h) Thinks things out before acting
22. (c) Steals from home, school or elsewhere
23. (pp) Gets on better with adults than with other children
24. (e) Many fears, easily scared
25. (h) Sees tasks through to the end, good attention span

(H) Would you say (CHILD'S NAME)'s health at the present time (in general) is excellent, very good, good, fair, or poor?

Excellent    Very good    Good    Fair    Poor

26. Overall, do you think that your child (child's name) has difficulties in one or more of the following areas: emotions, concentration, behaviour or being able to get on with other people?

- No
- Yes-minor difficulties
- Yes-definite difficulties
- Yes- severe difficulties

If **YES** to the above, ask these questions:

27. How long have these difficulties been present?

28. Do the difficulties upset or distress (your child)?

Not at all

Only a little

Quite a lot

A great deal

29. Do the difficulties interfere with your child's everyday life in the following areas?

Not at all

Only a little

Quite a lot

A great deal

a. Home life

b. Friendships

c. Classroom learning

d. Leisure activities

30. Do the difficulties put a burden on you or the family as a whole?

Not at all

Only a little

Quite a lot

A great deal