TAKING BULLYING BY THE HORNS: CHILDHOOD BULLYING BEHAVIOURS AND POOR MENTAL HEALTH

by

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Abstract

Background/Purpose

Research suggests there are various contributing factors that are associated with childhood bullying behaviour involvement, yet there is a dearth of longitudinal research examining the consequences of bullying behaviours on children's long-term mental health outcomes. The purpose of this study was to examine factors that influence bullying behaviours, as well as examine the detrimental effects of bullying behaviours on long-term internalizing problems.

Objectives

Objective 1 examined the cross-sectional association between children's internalizing symptoms and bullying behaviours, sub-objective 1 examined how overweight/obesity and peer relationships are associated with bullying behaviours, and objective 2 examined the temporal relationship between bullying behaviours and physician-diagnosed internalizing disorders over a seven-years timespan.

Method/Methodology

The study used data from the 2003 Children's Lifestyle and School Performance Study (CLASS), a population-based health survey of 4694 grade five students. Prospectively linking CLASS data to administrative health care records enabled examination of the temporal relationship between childhood bullying behaviours and physician-diagnosed internalizing disorders.

Results

Children who had high levels of internalizing symptoms and poor peer relationships were more likely to be involved in all forms of bullying behaviours (being a victim, being a bully, being a bully-victim). Children who had overweight/obesity were more likely to be a victim. Children who were victims had a higher rate of having a subsequent physician-diagnosed internalizing disorder between 2003-2010.

Conclusion and Implications

This research provides a greater understanding of the factors associated with bullying behaviours, as well as contributes new knowledge on the consequences of bullying behaviours for long-term internalizing problems. Furthermore, the findings provide evidence for the importance of early prevention strategies and policies to reduce bullying behaviours in children.

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Chapter One: Introduction

Bullying, an intentional and repeated form of aggression over time against a less powerful person or group by a more powerful person or group (Bogart et al., 2014), is on the forefront of childhood health concerns. Bullying behaviours can be categorized into three groupings (Sigurdson, Wallander, & Sund, 2014); being a victim - those who are the object of aggression, being a bully - those who are aggressive towards others, and being a bully-victim - those who bully others and are bullied themselves.

Bullying behaviours are identified as a childhood health concern due to their reported high prevalence in school environments (Benedict, Vivier, & Gjelsvik, 2015; Craig & Pepler, 2007; Espelage, Low, & Jimerson, 2014) and strong association to poor mental health (Gini & Pozzoli, 2009; Swearer, Song, & Cary, 2001). Research acknowledges that the understanding of mental health has to be moved away from primarily focusing on the individual and towards examining broader factors, such as social networks and environmental factors (Hodgins, 2008).

School-based settings are recognized as a primary environment where health behaviours can be developed, learned and reinforced (Hodgins, 2008; Espelage et al., 2014). Bullying in schools needs to be considered a serious public health issue, as children have little control over the environment where the bullying behaviours occur (Annerbäck, Lotta & Gun, 2014). Results from a large cross-national survey by Craig et al. (2009) found that on average 26% of children and adolescents reported that they were involved in a form of bullying behaviour - either as a victim, bully, or bully-victim - every year.

Bullying behaviours in school environments are consistently associated with common forms of internalizing problems (Annerbäck et al., 2014; Hodgins, 2008), and externalizing problems (Arseneault, Bowes, & Shakoor, 2010; Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2007; Craig, 1998; Kim & Leventhal, 2006). Internalizing problems primarily include symptoms of depression and anxiety, such as a poor mood, low self-esteem, worrying, physical complaints, shyness and difficulty sleeping (McMartin, Kuhle, Colman, Kirk, & Veugelers, 2012). Externalizing behaviours are comprised of overt aggression, such as self-harm and violence towards others (Arseneault et al., 2010).

Prior research on bullying behaviours mainly focused on externalizing problems (Craig, 1998). Previous studies found that there is an increased risk of having externalizing problems, such as self-harm, violent behaviour and, in extreme cases, suicidal acts among children involved in bullying behaviours (Arseneault et al., 2010; Klomek, Marrocco, Kleinman, Schonfeld, & Gould, 2007; Kim & Leventhal, 2006). However, research is increasingly focusing on internalizing problems as these behaviours, such as anxiety and depression have been widely linked to bullying behaviours (Arseneault et al., 2010; Gini & Pozzoli, 2013; Gower & Borowsky, 2013; Kaltiala-Heino, Rimpelä, Rantanen, & Rimpelä, 2000). Internalizing behaviours are most apparent in victims of bullying (Haynie, Nansel, & Eitel, 2001), such as being more anxious, having higher levels of insecurity and lower levels of self-esteem compared to children not involved in bullying behaviours (Baldry, 2004).

In addition to examining the association between children's internalizing problems and bullying behaviour involvement, Gini and Pozzoli (2013) stated that it is necessary to place more focus on examining the environmental and social factors that may influence bullying behaviour involvement. Research suggests various factors may increase a child's risk of being a bully or being bullied, including childhood obesity (Giletta, Scholte, Engels, & Larsen, 2010) and peer relationships (Papafratzeskakou, Kim, Longo, & Riser, 2011; Spriggs, Iannotti, Nansel, & Haynie, 2007).

Bullying behaviours are multi-factorial and are more prevalent in children with poor mental health, but can also put children at a heightened risk for developing future mental health problems (Benedict et al., 2015). Childhood bullying behaviours have long-term negative mental health impacts that can extend into adolescence/adulthood (Bogart et al., 2014; Bond, Carlin, Thomas, Rubin, & Patton, 2001; Copeland, Wolke, Angold, & Costello, 2013; Hodges & Perry, 1999; Wolke, Lereya, Fisher, Lewis, & Zammit, 2013)**.** More specifically, children who are victimized during childhood are more likely to develop long-term internalizing problems, such as diagnoses of depression and anxiety (Lereya, Copeland, Zammit, & Wolke, 2015; Reijntjes, Kamphuis, Prinzie, & Telch, 2010; Takizawa, Maughan, & Arseneault, 2014). There is therefore a need to better understand if being involved in bullying behaviours can lead to severe long-term mental health problems (Arseneault et al., 2010). Although the cross-sectional association between bullying behaviours and poor mental health has been widely studied (Annerbäck et al., 2014; Craig, 1998; Gini & Pozzoli, 2009, 2013; Hawker & Boulton, 2000; Kaltiala-Heino et al., 2000; Benedict et al., 2015), there is a dearth of longitudinal research on the relationship between bullying behaviours and long-term mental health

outcomes (Bond et al., 2001; Kim et al., 2006; Sigurdson, Undheim, Wallander, Lydersen, & Sund, 2015; Wolke et al., 2013; Zwierzynska, Wolke, & Lereya, 2013). A meta-analysis by Gini and Pozzoli (2013) emphasized the need for more longitudinal studies examining the consequences of bullying behaviours to further understand how repeated forms of aggression might have detrimental effects on long-term mental health outcomes. Furthermore, a study by Copeland et al. (2013) is one of only a few prospective cohort studies that examined the temporal relationship between childhood bullying behaviours and self-reported subsequent diagnoses of adult psychiatric disorders. This study found that victims of bullying were at a heightened risk to develop anxiety disorders, while victims and perpetrators of bullying behaviours were at an increased risk of depression and panic disorders (Copeland et al., 2013). Copeland et al.'s (2013) findings strongly support the notion that bullying behaviours may have direct detrimental effects on children's long-term mental health.

Examining the association between bullying behaviours and poor mental health is critical as one in five Canadians will experience a mental health illness in their lifetime (Canadian Mental Health Association, n.d.). Additionally, almost half of adult mental health disorders have an onset of symptoms before the age of 14 years (National Institute of Mental Health, 2005), therefore it is critical to examine if bullying behaviours may be an early risk factor for long-term mental health problems. Fekkes et al. (2006) stated that victims of bullying have significantly higher chances of developing new psychosomatic and psychosocial problems compared with children who are not victims. Additionally, children who experience mental health problems are more likely to be involved in all forms of bullying behaviours, which can put them at an increased risk for developing

future mental health disorders (Arseneault et al., 2010). Although bullying prevention strategies have been carried out in school-environments in the past 15 to 20 years, the effectiveness of these programs have been limited (Holt, Raczynski, Frey, Hymel, & Limber, 2013). It is important to unravel the multi-factorial association between bullying behaviours and poor mental health as well as examine if bullying behaviors are a risk factor for future mental health problems. Being aware of these connections can support the development of targeted and effective policies and early prevention strategies.

The opportunity to study bullying behaviours and poor mental health in children was afforded through an analysis of data from the Children's Lifestyle And School Performance Study (CLASS) (Veugelers & Fitzgerald 2005). The 2003 CLASS study is a population-based, province-wide health survey that was completed by over 5000 grade five students and their parents from elementary schools across Nova Scotia, Canada (Veugelers & Fitzgerald, 2005). The 2003 CLASS asked parents to provide consent to have their children's survey data linked to children's administrative health care records. In 2014, Alberta Innovates Health Solutions (AIHS) provided funds to Dr. Veugelers for an additional data linkage that allowed an examination of bullying behaviours and future mental health outcomes.

Study Objectives

The purpose of this study was to examine the factors associated with bullying behaviours, as well the temporal relationship between childhood bullying behaviours and long-term mental health outcomes. More specifically, the study focused on examining the relationship between bullying behaviours and internalizing problems. Recent research has consistently found a strong link between bullying behaviours and common forms of

internalizing behaviours (Gini & Pozzoli, 2009, 2013; Swearer et al., 2001), but further investigation is needed to understand if internalizing problems are associated, as well as a consequence of bullying behaviour involvement.

Having the 2003 CLASS data linked to children's administrative health care records by Health Data Nova Scotia (HDNS) enabled examination of the following objectives:

Objective 1. To examine the cross-sectional association between internalizing symptoms and bullying behaviours of grade five students from schools across Nova Scotia, Canada.

Sub-Objective 1. To examine the factors of childhood obesity and peer relationships that may have a cross-sectional association with bullying behaviours of grade five students from schools across Nova Scotia, Canada

Objective 2. To determine the consequences of bullying behaviours, by examining the temporal relationship between bullying behaviours in grade five students and the number of physician-diagnosed internalizing disorders over a seven-year timespan across Nova Scotia, Canada.

Role of the Researcher

The opportunity to have access to the 2003 CLASS data and administrative health care records provided by HDNS was available through the Collaborative Research and Innovation Opportunities (CRIO) granted through AIHS.

The current study is part of the Return on Investment for Kids Health (ROI4kids) research project. ROI4Kids is a five-year collaborative project co-led by Dr. Veugelers (Principal Investigator) and Dr. Arto Ohimaa that aims to evaluate and examine the

effectiveness and implementation of school health programs and policies, as well as estimate the costs and savings of policies, programs, public health initiatives and healthcare costs/burdens across Canada.

The current study expands on earlier work using the 2003 CLASS to understand factors associated with children's mental health. Past research using the 2003 CLASS dataset includes childhood obesity and self-esteem (Wang & Veugelers 2008), prevalence of poor body satisfaction and its relation to body weight and socio-demographic factors (Austin, Haines, & Veugelers, 2009) and the temporal relationship between diet quality and subsequent physician-diagnosed internalizing disorders (McMartin, Kuhle, Colman, Kirk, & Veugelers, 2012). The current study sought to examine the factors associated with bullying behaviours, as well as to examine the prospective relationship between children's bullying behaviours and physician-diagnosed internalizing disorders, as defined by administrative health care records. To our knowledge, this is the first study examining the consequences of bullying behaviours on future physician-diagnosed internalizing disorders using a longitudinal study design with a population-based sample in Nova Scotia, Canada.

Dr. Veugelers and Dr. Ohinmaa provided access to the linked data and supported me through a stipend for my Masters training from AIHS. My role in the study was to synthesize the evidence, conduct the literature review, form the research objectives, plan the analytic approach, conduct the data analysis and interpret, articulate and present the findings according to the stated objectives.

Chapter Two: Literature Review

Bullying Behaviours

Research emphasis on bullying behaviours emerged in the 1970's when Dan Olweus, a Norwegian researcher, published a research novel titled *"Aggression in the Schools –Bullies and Whipping Boys"* (Aluede, Adeleke, Omoike, & Afen-Akpaida, 2008). This novel is now considered a foundational study of bullying behaviours (Aluede et al., 2008). Prior to this novel's release, there was a preconceived notion that bullying behaviours were a normal part of youth development and therefore not seen as harmful (Arseneault et al., 2010; Warren, 2011). It was a common myth among scientists and non-scientists that consequences of bullying may in fact have been beneficial for children's development (Berger, 2007). However, this myth quickly diminished among researchers after the work of Olweus was published. The past two decades of research on bullying behaviours have been dedicated to challenging this view, following consistent findings on the negative short and long-term effects of bullying behaviours (Gini & Pozzoli, 2013; Reijntjes et al., 2010; Swearer, Espelage, Vaillancourt, & Hymel, 2010).

The landmark definition of bullying behaviours by Olweus is consistent across the literature and refers to bullying as when a person is exposed repeatedly and over time to negative actions on the part of one or more other persons (Aluede et al., 2008; Gower & Borowsky, 2013). Negative actions can involve intentional injury or discomfort to another (Aluede et al., 2008). Inflicting bullying onto another can be broken down into two categories; direct and indirect bullying. Aluede et al. (2008) defined direct bullying as open attacks on the victim, while indirect bullying refers to socially isolating and excluding a victim from a group. Indirect bullying can also include verbal and emotional

abuse including teasing, harassing, and name-calling (Baldry, 2004). Indirect bullying is shown to have the most long-lasting impact on victims of bullying (Aluede et al., 2008).

Bullying behaviours are believed to be prominent in school environments across Canada (Craig & Pepler, 2007), but research on the prevalence of bullying behaviours in Canadian children is limited. As reported by the World Health Organization (WHO) in their global Health Behaviours in School-aged Children (HBSC) survey, Canada lags behind on measures of bullying, ranking 26th of 35 countries (Craig & Pepler, 2007). Past findings showed that 49% of Canadian students reported being bullied at least once or twice during the school term (Province of Nova Scotia, 2013). Locally in Nova Scotia, 32% reported being bullied monthly (Province of Nova Scotia, 2013). However, there is variability in the research on the role of poor mental health as a contributor to and/or a consequence of bullying behaviours.

Objective 1: Cross-sectional association between Poor Mental Health and Bullying Behaviours

Poor school performance (Gini & Pozzoli, 2013; Spriggs et al., 2007; Berger, 2007), physical health problems (Annerbäck et al., 2014) and most prominently, poor mental health are shown to be associated with bullying behaviours. The association between poor mental health and bullying behaviours is well documented (Arseneault et al., 2010; Gini & Pozzoli, 2013; Gower & Borowsky, 2013; Hodgins, 2008; Kaltiala-Heino et al., 2000) and suggests that children who have poor mental health, such as symptoms of anxiety and depression, are more likely to be victims of bullying, as well as perpetrators (Gini & Pozzoli, 2009, 2013). Additionally, children are at a heightened risk of developing poor mental health due to the stress associated with bullying behaviours

(Baldry, 2004; Reijntjes et al., 2010). There are concerns that consequences of bullying behaviours can worsen current mental health status and are seen as an "agent" for the development of long-term mental health problems (Reijntjes et al., 2010).

Previous cross-sectional studies have indicated that children targeted by bullies show signs of internalizing symptoms (Arseneault et al., 2010; Gini & Pozzoli, 2009b; Hawker & Boulton, 2000; Kaltiala-Heino et al., 2000), as well as externalizing behaviours (Arseneault et al., 2010; Klomek et al., 2007; Kim & Leventhal, 2006). Children who are victims of bullying tend to suffer more from internalizing behaviours, such as depression, anxiety and low self-esteem (Haynie et al., 2001). It is hypothesized that children who manifest symptoms of anxiety and depression may send signals that they are easy targets for victimization and may not retaliate against the bullies that are unkind to them (Arseneault et al., 2010).

Furthermore, children who are bullies are also shown to encompass common forms of internalizing problems (Bosworth, Espelage & Simon, 2001;Benedict et al., 2015). Baldry (2004) hypothesized that bullying others is an indicator of maladjustment and therefore bullying behaviours may worsen children's mental health due to the stress attached to the actions. However, the association between internalizing behaviours and being a bully is less consistent, and research has found that children who become bullies may express their emotions more through externalizing behaviours (Kelly et al., 2015; Swearer et al., 2001).

Past cross-sectional research primarily focused on the negative mental health impacts of being a victim or being a bully, but there is a shortage of evidence about whether worsened mental health is associated with being a bully-victim (Swearer et al.,

2001) . Swearer et al.'s (2001) findings on the association between symptoms of depression/anxiety and bullying behaviours indicated that children who are bully-victims have heightened levels of internalizing behaviours compared to bullies, victims and non-involved peers. Additionally, research suggests that bully-victims also have an enhanced level of negative externalizing behaviours and aggression compared to children who are not involved in bullying behaviours (Arseneault et al., 2010; Kim et al., 2006).

Studies that have examined the independent association between poor mental health and bullying behaviours, after controlling for environmental factors, have found that there is a direct link between the two factors (Bond et al., 2001). The most common mental health problems that are co-morbid with bullying behaviours are internalizing behaviours, such as low self-esteem, depression and anxiety. Low self-esteem is a prominent mental health factor that is directly linked to bullying behaviours (Bond et al., 2001; Egan & Perry, 1998) and connected to various other mental and physical health issues (Mann, Hosman, Schaalma, & de Vries, 2004; Whitney, Sullivan, & Herman, 2010; Williams et al., 2013). Self-esteem is defined as a function of how a person perceives him or herself, in addition to the feedback one receives from others in society (Whitney et al., 2010). Low self-esteem refers to a person who has a negative attitude, devalues and has poor feelings about him or herself (Zimmerman, Copeland, Shope & Dielman, 1997).

Empirical studies over the last 15 years indicate that low self-esteem is an important psychological factor (Mann et al., 2004) and plays a critical role in the development of other mental health issues, such as depression (Mann et al., 2004;

Whitney et al., 2010; Williams et al., 2013), anxiety (Mann et al., 2004) and high risk behaviours (Mann et al., 2004).

A consistent connection between low self-esteem and bullying behaviours is prominent throughout the literature (Bond et al., 2001; Egan & Perry, 1998; Gini & Pozzoli, 2013; Goldbaum, Craig, & Connolly, 2003; O'Moore & Kirkham, 2001), as children rely on their peers for social support and identity (Janssen, Craig, Boyce, & Pickett, 2004). In a nationwide study in Ireland on bullying behaviours in school-age children 8 to 18 years (N = 8249) the associations between children/adolescents who were either victims or bullies and self-esteem were examined (O'Moore & Kirkham, 2001). Findings indicated that children/adolescents who had lower levels of self-esteem were more involved in all forms of bullying compared to children who were not involved in bullying behaviours. O'Moore and Kirkham's (2001) finding that lower self-esteem is associated with being bullied is consistent across the literature (Bond et al., 2001; Egan & Perry, 1998; Moore & Kirkham, 2001), but there are mixed results as to what role self-esteem plays for children who are bullies (O'Moore & Kirkham, 2001).

In addition, children who are involved in bullying behaviours are more likely to have feelings of depression and anxiety. Research consistently shows that depression and anxiety symptoms are important indications of children's emotional adjustment (Craig, 1998). Children who are victims of bullying or are bullies display heightened symptoms of depression compared to their non-involved peers (Craig 1998; Hawker & Boulton, 2000). Slee (1995) investigated the relationship between depression and victims/bullies. For both genders, high levels of depression and unhappiness at schools were significantly associated with victimization. Moreover, Slee (1995) also found a significant association

between depression and being a bully. Swearer et al.'s (2010) review on depression/anxiety symptoms and bullying behaviours, found that children who had increased levels of depression were more likely to be bullies compared to victims, while children who had higher levels of anxiety were more likely to be victims of bullying behaviours.

Rejection from the peer group, exclusion from social activities, gatherings and being ignored by friends and classmates can be considered indirect aggression that could heighten levels of anxiety in an individual and make them more prone to being a victim of bullying (Craig, 1998). Furthermore, Silverman, La Greta and Wassterin (1995) claimed that an increased risk for anxiety among victims and bully-victims may be due to repeated aggression overtime that may result in further psychological harm. There are inconsistent results on whether children who are bullies express feelings of anxiety. Swearer et al. (2010) and Slee (1995) found that children who were bullies do not have heightened feelings of anxiety, which is consistent with past research by Olweus (1993). However, Swearer et al. (2001) stated that a critical aspect to take into consideration is that anxiety symptoms are often co-morbid with other mental health issues, such as depression and conduct problems. It is hypothesized that children who are bullies may express their anxiety in other forms such as increased levels of aggression. Previous research that examined comorbid anxiety in first graders who expressed aggressive behaviour, indicated that feelings of anxiety may strengthen the presence of their aggressive behaviour **(**Ialongo, Edelsohn, Werthamer-Larsson, Crockett, & Kellam, 1996).

In whole, Gini and Pozzoli's (2013) meta-analysis supports the notion that victims, bullies and bully-victims experience internalizing problems more frequently than their peers who are not involved in bullying behaviours. Although cross-sectional studies can demonstrate a strong association between poor mental health and bullying behaviours, and vice versa, the methodological design cannot determine temporality. The association between internalizing behaviours and bullying behaviours is interconnected and one cannot infer the other. It is important to understand if poor mental health is a contributing factor to bullying behaviours involvement, yet it is difficult to understand the consequences that bullying behaviours have on the development of mental health problems without a long observation period. To understand the detrimental effects of bullying behaviours, longitudinal studies on the relationship between childhood bullying behaviours and mental health outcomes are needed.

Sub-Objective 1: Cross-sectional association between Other Factors influencing Bullying Behaviours

In addition to understanding the cross-sectional association between internalizing symptoms and bullying behaviours, it is important to examine what other factors could influence the risk of being involved in bullying behaviours (Arseneault et al., 2010). Factors such as childhood obesity (Giletta et al., 2010) and peer relationships, (Papafratzeskakou et al., 2011; Spriggs et al., 2007), are shown to strongly increase the risk of bullying behaviour involvement.

Childhood obesity and bullying behaviours. Body weight is demonstrated to play a prominent role in the level of bullying behaviour involvement, such that children who have obesity are more likely to be targets of bullying (Giletta et al., 2010; Jansen et

al., 2014; Puhl & King, 2013). School age children who have overweight or obesity are also more likely to be perpetrators of bullying behaviours compared to their peers of normal weight (Jansen et al., 2014). The relationship between obesity and increased likelihood of being involved in bullying behaviours is shown to be significant even after controlling for other confounding variables, such as gender, race, social skills and grade level (Lumeng, Appugliese, Kaciroti, Corwyn, & Bradley, 2010; Puhl, & King, 2013). A prospective cohort study (N = 8210) in southwest London measured height and weight of children at the age of 7.5 years and assessed overt (physical) and relational (social) bullying at the age of 8.5 years (Griffiths, Wolke, Page & Horwood, 2006). The findings demonstrated that obesity in children was predictive of bullying behaviours later in childhood (Griffiths et al., 2006). This finding is congruent with Kukaswadia, Craig, Janssen, and Pickett's (2011) longitudinal analysis on the relationship between obesity and bullying behaviours in 1,738 Ontario youth. Kukaswadia et al. (2011) found that obesity was linked to an increased risk of bullying perpetration and victimization that can be attributed to the appearance of children with obesity.

The emotional changes due to victimization of children who have overweight or obesity are shown to increase the risk of depression, anxiety, low self-esteem and body-dissatisfaction (Puhl & King, 2013) and adversely affect development (Williams et al., 2013). Data from Hesbeth, Wake and Waters (2004) study supports a strong relationship between low self-esteem and having obesity in childhood.

Children with obesity exhibit lower self-esteem resulting in higher levels of victimization (Jansen et al., 2014) and increased depression and anxiety (Puhl & King, 2013). Giletta, Scholte, Engels and Larsen (2010) stated that internalizing problems such

as high levels of depressive symptoms and low self-esteem might partially explain the relationship between weight and victimization.

Few past studies have taken into consideration psychological factors that may play a role in the relationship between obesity and peer victimization (Giletta et al., 2010). It is suggested that low levels of psychological well-being may have negative consequences on the self-perception of children who have obesity and who are victimized and/or bullied (Giletta et al., 2010). Janssen et al. (2004) emphasized the importance of negative social and psychological ramifications that can evolve from childhood obesity. It is proposed that these negative psychological factors can increase from being liked to a lesser degree by peers, rejected by peers and being the victim of bullying behaviours (Janssen et al., 2004). Furthermore, obesity is a prominent physical feature (Craig et al. 2010) and children may be at an increased risk of victimization as perpetrators are more likely to bully peers who are seen as physically, as well as emotionally different (Aluede et al., 2008; Craig et al. 2010).

To fully understand the relationship between obesity and bullying behaviours, examination is needed to understand if weight status is independently associated with bullying behaviour involvement or if the proposed link is primarily due to psychological factors such as the increased perception of victimization in children who have overweight/ obesity.

Peer relationships and bullying behaviours. Peer relationships are one of the most studied social determinants of bullying involvement (Spriggs et al., 2007) and cannot be overlooked when investigating the factors associated with bullying behaviours. The current research on peer relationships highlights their importance across the lifespan.

Annerbäck et al. (2014) stated that peer relationships refer to the various reasons why children are accepted or rejected by their classmates, such as being neglected, being withdrawn, being aggressive, and being unpopular. Zwierzynska et al. (2013) highlighted the importance of examining the underlining factors that contribute to peer victimization when seeking to understand the etiology of internalizing behaviours.

Victims and bully-victims are shown to have worse peer relationships compared to their non-bullied peers (Spriggs et al., 2007), but the findings are inconsistent when it comes to understanding the impact of peer relationships on bullies. Spriggs et al.'s (2007) study found that children who were bullies had worse peer relationships, while Aluede et al. (2008) argued that children who are bullies have greater peer relationships due to popularity and power status.

The negative impact of peer relationships on factors of well-being is more prominent for children who are victims of bullying. Past research has indicated that victims of bullying have poorer peer relationships (Healy, Sanders & Iyer, 2013; Spriggs et al., 2007), have fewer friends (Haynie et al., 2001) and are more rejected by classmates compared to non-victimized peers (Boulton, Trueman, Chau, Whitehand, & Amatya, 1999). Children who have supportive relationships and a sense of belonging from peer groups are less likely to be involved in problematic behaviours, such as bullying (Sarkova et al., 2014). Victims and bully-victims all reported lower school attachment compared to non-involved peers (Haynie et al., 2001) and bully-victims are found to be the most isolated and least well-liked (Haynie et al., 2001).

Exploring the association between peer relationships and bullying behaviours is critical as children who are exposed to poor peer relationships are more likely to have

signs of poor mental health (Sarkova et al., 2014). Papafratzeskakou et al. (2011) investigated what role peers and parent-child relationships play in the association between peer victimization and depressive symptoms. A sample of 261 youth (age 10 to 14) completed measures on depressive symptoms, peer/parental relationships and victimization (Papafratzeskakou et al., 2011). Findings illustrated a significant moderation effect, such that physical victimization was associated with depressive symptoms among youth with lower peer support. Papafratzekakou et al. (2011) suspected that children rely heavily on support from their friend groups rather than their parents when negative experiences involve peers. High peer support acts as a protective factor for peer victimization (Papafratzeskakou et al., 2011). Consistent findings on the association between peer relationships and bullying behaviours were demonstrated by Sourander et al. (2009) study. Sourander et al. (2009) found that the association between poor peer relationships and bullying behaviours was related to psychiatric problems in early adulthood and up to 32 years later.

The impact that peer relationships have on bullying behaviours can come through various pathways such as aggression (Healy et al., 2013), lack of peer belonging (Sarkova et al., 2014) and level of self-esteem **(**Papafratzeskakou et al., 2011; Sarkova et al., 2014). Sarkova et al.'s (2014) study examined whether there was a relationship between pupil-peer and pupil-teacher relationships and psychological well-being/self-esteem and if this association varied with being a victim or perpetrator of bullying. A sample of 3964 students from elementary schools in Slouvaki was recruited for the study. The findings indicated that better pupil-peer relationships and better pupil-teacher relationships were significantly related to less depression, anxiety and social dysfunction, as well as higher

self-esteem. Sarkova et al. (2014) also emphasized that peer relationships are an important factor in regard to bullying behaviours as low popularity and lack of friends are found to be associated with victimization. The link between peer relationships and peer victimization is well studied compared to the association between peer relationships and bullies/bully-victims.

Objective 2: Bullying Behaviours and Long-term Mental Health Disorders

Studies to date that examine the association between bullying behaviours and poor mental health are predominantly cross-sectional in nature (Bogart et al., 2014; Espelage et al., 2014), or have a short observation period **(**Arseneault et al., 2010; Reijntjes et al., 2010). Cross-sectional studies are important to give a snapshot of the population subsets in which bullying behaviours occur, but they cannot determine if being involved in bullying behaviours has further impacts on long-term mental health problems.

Longitudinal studies are critical to understand if the negative impact of childhood bullying behaviours translates into future mental health problems. If a strong direct link between childhood bullying behaviours and future mental health problems is found, early interventions can focus on decreasing the prevalence of bullying behaviours, as well as reducing the distress that occurs in children involved in bullying behaviours (Hawker & Boulton, 2000).

The limited longitudinal studies that have been conducted give strong support for the link between bullying behaviours and long-term mental health problems (Bogart et al., 2014; Bond et al., 2001; Copeland et al., 2013; Hodges & Perry, 1999; Lereya et al., 2015; Reijntjes et al., 2010; Sourander, Helstelä, Helenius, & Piha, 2000; Sourander et

al., 2009; Stapinski et al., 2014), with a particularly strong connection between peer victimization and long-term internalizing problems (Bogart el al., 2014; Takizawa et al., 2014; Zwierzynska, Wolke, & Lereya, 2013). Bogart et al. (2014) study surveyed 4297 children over three time points (fifth, seventh and tenth grade) and findings indicated that worse internalizing behaviours, such as depressive symptoms and lower self-worth were associated with both past and present experiences of bullying behaviours.

The strength of longitudinal studies lies in the use of prospective measures of bullying behaviours and mental health outcomes (Arseneault et al., 2010; Copeland et al., 2013). An extensive five-decade longitudinal study by Takizawa et al. (2014) used data (N = 7,771) from the British National Child Development Study (50 year prospective cohort of births in one week in 1958) to examine the temporal relationship between victimization and the development of mental health problems. Parents who reported that their child was exposed to bullying at ages 7 to 11 years and had a follow-up assessment between the ages of 23 and 50 years were included in the study. The results indicated that children who were victims of bullying had a higher likelihood of having internalizing disorders between the ages of 23 to 50 years, such as diagnoses of depression and anxiety. Participants who were victimized also had increased levels of self-harm and suicidal ideations. Similar results were found by Zwierzynska et al., (2013) longitudinal study (N = 3,692) that examined the short and long-term effects of peer victimization on internalizing problems in the Avon Longitudinal Study of Parents and Children (ALSPAC).

Longitudinal studies show a strong link between being involved in childhood bullying behaviours and an increased risk of developing severe internalizing problems

(Copeland et al., 2013; Hodges & Perry, 1999; Takizawa et al., 2014). However, it is still unclear if bullying behaviours have a direct link to future mental health outcomes, or if this link is mediated by other emotional factors (Arseneault et al., 2010; Bond et al., 2001), such as the early development of internalizing behaviours, including depressive symptoms (Arseneualt et al., 2010; Bond et al., 2001), anxiety (Arseneualt et al., 2010; Bond et al., 2001), and low self-esteem (Bond et al., 2001; Egan & Perry, 1998). Longitudinal studies that control for early symptoms of depression, anxiety and self-esteem are critical in systematically understanding the consequences of early childhood bullying behaviours on future mental health outcomes. Kraemer et al. (2001) reiterates this concern, emphasizing that longitudinal studies examining long-term mental health outcomes tend to suffer from confounders, such as baseline psychological symptoms, as well as other factors influencing bullying behaviours, such as family characteristics, and levels of parental mental health. It is critical to control for early psychological symptoms to understand if the harmful effects occurring from bullying behaviour involvement do have a direct link to future mental health problems, or if this link is due to children having pre-existing mental health problems during childhood. Copeland et al.'s (2013) population-based prospective cohort study found that children who were victims in childhood were still more likely to self-report having subsequent psychiatric problems of anxiety, and panic disorder after controlling for childhood psychiatric problems and family characterises, but this relationship was not significant for depressive disorders. On the contrary, Ronning et al.'s (2009) study on the long-term psychiatric outcomes of eight-year old boys found that no subsequent psychiatric disorders were related to bullying or victimization after controlling for early indicators of childhood mental health

problems. Psychiatric outcomes included common internalizing disorders (anxiety, and depression), substance abuse, psychotic disorder and adjustment disorder. Further research is needed to understand if bullying behaviours can lead to the development of future mental health problems, as well as if being involved in bullying behaviours can further increase the severity of mental health issues.

Implications of Research to Health Promotion Practice

Due to the reported high prevalence of bullying behaviours in school environments (Jenson, Brisson, Bender, & Williford, 2013; Province of Nova Scotia, 2013), there has been considerable growth in the popularity of bullying prevention programs in the past 15 to 20 years (Low & Ryzin, 2014; Swearer, Espelage, Vaillancourt, & Hymel, 2010). Holt et al.'s (2013) review on bullying behaviour prevention programs categorised prevention strategies into three categories; a whole-school approach, a community-based approach and a stand-alone approach. The review illustrated that prevention strategies that take a whole-school approach or community-based approach to bullying behaviours are the most effective as they take a health promotion approach in attempt to foster a positive school climate. A school climate is most consistently referred to as the overall character and quality of the school culture (Espelage et al., 2014). A health promotion approach to bullying behaviours moves beyond a primary focus on individual behaviors and takes into consideration a broader range of social and environmental factors that can influence the health of individuals (World Health Organization, n.d.). Espelage et al. (2014) emphasized that a positive school climate does not tolerate bullying behaviours and other forms of aggressive behaviour, but building and maintaining a positive school-environment is complex. A

focus on population-based health research can help health practitioners, educators and policy makers understand the factors that contribute to bullying behaviour involvement and their link to poor mental health. Research on the relationship between bullying behaviours and mental health can assist in advocating for further support, funds and resources to harness effective and sustainable prevention strategies.

Gaps in Research

The association between bullying behaviours and poor mental health is a topic of concern due to widespread findings on the negative effects that occur for individuals involved in some form of bullying behaviours. However, there are various gaps in the research that need to be addressed to further validate the past findings. First, Berger (2007) emphasized that, although there are significant research findings on the negative effects of bullying behaviours, research on the topic has yet to receive the scientific attention needed to systematically understand the full impact of bullying behaviours on individual health factors. More specifically, there is limited research on the longitudinal effects of children's bullying behaviours on mental health problems and Wolke et al. (2013) reiterates that existing longitudinal studies are predominately short-term with twelve months to five years of observation time. Moreover, past prospective research on bullying behaviours and later mental health outcomes has primarily used self-report or interview assessment as a measure of long-term mental health outcomes (Bond et al., 2001; Sigurdson et al., 2015; Wolke et al., 2013) and these methodological designs can give a biased representation of the severity of mental health issues. The present study will contribute to reducing the gap in the research by examining factors that influence bullying behaviours, and then determine the consequences of bullying behaviours by

prospectively tracking the number of physician-diagnosed internalizing disorders a child has over a seven-year timespan in a population-based sample. Recent longitudinal research has predominately focused on symptoms of internalizing behaviours, such as low levels of self-esteem, high anxiety and feelings of depression (Bond et al., 2001; Kaltiala-Heino, Fröjd, & Marttunen, 2010; Kaltiala-Heino, et al., 2000), while the present study will use the number of physician-diagnosed internalizing disorders, as defined by administrative health care records as a measure for mental health outcomes. The study focused on examining the link between bullying behaviours and internalizing problems due to the growing body of knowledge supporting this interconnected relationship (Hawker & Boulton, 2000; Reijntjes et al., 2010; Takizawa et al., 2014). Bullying behaviours affect all children worldwide and have short and long lasting effects on children's mental health and development (Berger, 2007), making this an important topic to understand.

Chapter Three: Methods

Study Design

The study used survey information of grade five students from the 2003 Children's Lifestyle and School Performance Study (CLASS) (Veugelers & Fitzgerald 2005). CLASS was completed in 2003 in elementary schools from across Nova Scotia, Canada (Veugelers & Fitzgerald, 2005). Survey information was linked to provincial administrative health care records to access information on participants' physician-diagnosed internalizing disorders. Nova Scotia provincial administrative health care records were provided and held by HDNS. The opportunity to conduct this linkage was afforded by an AIHS award to Veugelers and Ohinmaa in 2014.

Sample Selection

Sample population. The sample population consisted of grade five students (age 10 – 11 years) who completed the 2003 Children's Lifestyle and School Performance Study (CLASS) student survey and had their weight and height measurements taken by trained research assistants (Veugelers & Fitzgerald, 2005). Additionally, the parents of the grade five students completed a home survey, and gave consent to have their child's survey information linked to administrative health care records. The students recruited for the study were from 282 (96.9%) of the 291 elementary schools in Nova Scotia, Canada (Veugelers & Fitzgerald, 2005). Parental consent was obtained for 5517 students. Of the 5517 students, 5180 students completed the survey resulting in an average response rate of 51.1% per school (Veugelers & Fitzgerald, 2005). Out of the 5180 students there were

4736 parents who gave parental consent to have their children's survey information linked with administrative health card records over a seven-year timespan. I chose to exclude students from the sample if they had missing information for both the questions pertaining to bullying behaviours ('I am bullied by other kids' and 'I bully other kids') (n = 42). These were excluded because a response to at least one of these questions was essential to address the study objectives. The final sample was comprised of a total of 4694 respondents.

Sample rationale. Grade five students were selected to participate in the 2003 CLASS survey because the students also completed a grade six language arts and reading assessment that was authorized by the Nova Scotia Department of Education in the 2003/2004 school year (Wang & Veugelers, 2008). Additionally, children of this age are more likely to bring consent forms home to their parents or guardians compared to younger children.

Sample criteria. All students in Nova Scotia who met the following inclusion criteria for the study were eligible to participate in the 2003 CLASS survey: (1) Attended a grade five class at a Nova Scotia school that had provided consent for the study to take place, and (2) Obtained parental/guardian consent and provided the child's health card number. If a grade five student attended a private school he or she was not eligible for the study, (1% of grade five students in Nova Scotia are in private schools).

Measures

2003 Children's Lifestyle and School Performance Study (CLASS). The 2003 Children's Lifestyle and School Performance Study (CLASS) was a province-wide, population-based self-administered survey that consisted of a student survey and a home

survey about children's physical health, friendships, behaviours, nutrition, lifestyle factors and socio-demographic information (Veugelers & Fitzgerald, 2005). Sections that align with the exposures and outcomes of interest in the current study were used for data analysis.

Internalizing symptoms. Questions from the CLASS student survey section: *My Friendships, Self-Esteem, And Behaviour* were used to quantify internalizing symptoms. I created the measurement for internalizing symptoms from the existing measurement on the 2003 CLASS that originally was developed to measure self-esteem. The self-esteem measure was based on a number of instruments that were developed in the past decades to assess self-esteem in distinct groups and for specific purposes (Bracken, 1996; Statistics Canada, n.d.). From the existing instruments, Veugelers and the CLASS research team selected 11 items that were previously validated (Statistics Canada, n.d.), pilot tested (Statistics, n.d), and suitable for the age group (Wang & Veugelers, 2008). The items to test for self-esteem included: (1) I am bullied by other kids, (2) I bully other kids, (3) I get into physical fights, (4) I feel like I don't have any friends, (5) I like myself, (6) I like the way I look, (7) My future looks good to me, (8) I feel unhappy or sad, (9) I worry a lot, (10) I cry a lot, and (11) I have trouble paying attention. Response choices for the questions ranged from 'never or almost never', 'sometimes' to 'often or almost always.'

A new measure was re-interpreted to measure internalizing symptoms rather than primarily measuring self-esteem, as the items chosen for inclusion were items that are shown to pertain to other internalizing behaviours, such as common symptoms of depression, and anxiety. I chose eight of the 11 items to measure internalizing

symptoms. Two of the items of were excluded as they were used to measure bullying behaviours ('I bullied by other kids' and 'I bully other kids'). Additionally, the item 'I get into physical fights' was excluded from the measure, as it is an item used to commonly measure externalizing behaviours, such as angry-externalizing coping strategies (Marini, Dane, Bosacki, & YLC-CURA, 2006), aggression (Hodges & Perry, 1999), and externalizing/hyperactive behaviours (Kumpulainen, Räsänen, & Henttonen, 1999). Moreover the item 'I get into physical fights' did not map onto any instruments measuring common forms of internalizing symptoms. The final measure for internalizing symptoms included the following items: (1) I feel like I don't have any friends, (2) I like myself, (3) I like the way I look, (4) My future looks good to me, (5) I feel unhappy or sad, (6) I worry a lot, (7) I cry a lot (8) I have trouble paying attention. Items 2, 3 and 4 were reversed scored. Similar items have been used to measure depression, anxiety and/or low self-esteem on the Beck Depression Inventory (Craig, 1998; Kaltiala-Heino et al., 2000), Kovacs' (1985) Children's Depression Inventory (Craig, 1998; Papafratzeskakou et al., 2011), Achenbach and Edelbrock's (1983) Child Behaviour Check List for Youth Self-Report (Baldry, 2004), the Dutch version of the Center for Epidemiological Studies-Depression scale (CES-D) (Faulstich, Carey, Ruggiero. Enyart, Gresham, 1986; Giletta et al., 2010), and the Revised Child Anxiety and Depression Scale (RCADS) (Ghoul, Niwa, & Bower, 2013).

Total response choices ranged from 8 to 24. The inter-item reliability of the eight items was 0.64, which is respectable due to diversity in psychological constructs being measured (Field, 2009). I chose to dichotomize the variables based of the 75th percentile. Responses that were equal or above the 75th% percentile (=> 13) were categorized as 1

(High Internalizing Symptoms), responses that were below the 75% percentile (<13) were categorized as 0 (Low Internalizing Symptoms), and missing data (N = 117) were categorized as 9 (Missing).

Peer relationships. In 2003, Veugelers and the CLASS research team drafted a number of questions for students and parents relating to peer relationships that were discussed with an expert panel. The questions were piloted among students and their parents and then used for the 2003 CLASS survey.

I chose five questions from the CLASS student survey section: *My Friendships, Self-Esteem, And Behaviour* and questions from the CLASS home survey section*: Your Fifth Grade Child's Friendships and Behaviours* that were used to create a peer relationships measure. Questions from the student survey included: (1) In my class I like…(Most of the kids, Some of the kids, Only 1 or 2 kids, I don't like any of the kids in my class), (2) At recess do you usually play with … (by yourself, with one other friend, with more than one other friend), (3) How often do you get along with their friends (never or almost never, sometimes, frequently, almost always or always, or I do not have any friends). Questions from the home survey included: (1) How well does your fifth grade child get along with other children his or her age, not including brothers or sisters? (Very well, no problems, Quite well, hardly any problems, Pretty well, occasional problems, Not too well, frequent problems, Not well at all, constant problems), (2) Does your fifth grade child have a close friend or friends with whom he or she plays regularly? (Yes, many close friends, Yes a few close friends, Yes, 1 close friend, Not at the moment, My child has not had any close friends in the past few years.

To further validate the questions, I did a scan of related literature to map the 2003 CLASS questions on peer relationships to previous research that examined the relationship between peer relationships and bullying behaviours. Questions pertaining to children's peer relationships were similar to past research including Sprigg et al.'s (2007) measure of peer relations using three sub-groups (social isolation, classmate relations, extracurricular involvement) from the U.S. Health Behaviour in School-aged Children (HBSC) cross-national survey, and Sarkova et al. (2014) study that measured peer relationships using the 2003 Pupils' questionnaire of the OECD Programme for International Student Assessment.

The five questions had a Cronbach alpha of 0.62 and total scores ranged from 5 to 25. Field (2009) notes that a Cronbach alpha of 0.60 to 0.70 is respectable considering the low number of items in a scale. Responses that were equal to or above the 75th percentile (=>8) were classified as 1 (Poor Peer Relationships), responses that were below the 75th percentile (<8) were categorized as 0 (Good Peer Relationships) and missing responses (N = 352) were classified as 9 (Missing).

A split at the 75th percentile was chosen, as both the measures were right skewed, therefore the highest scores were compared to the referent groups. Dichotomizing variables is a common approach to categorize a continuous variable into high and low groups (MacCallum, Zhang, Preacher, & Rucker, 2002). Although there are various limitations to binding a continuous variable, such as loss of data, and error in variance (MacCallum et al., 2002; Osborne, 2012), the practice of dichotomizing variables in health and epidemiology research is common for practical and statistical purposes. Williams, Mandrekar, Cha, & Furth (2006) indicated that dichotomizing variables is

beneficial in offering a simple risk classification into "high" versus "low". Moreover, dichotomizing variables can help avoid the linearity assumption common for continuous variables, offers an easier interpretation for odds ratios and relative risk and makes data summarization more simple to comprehend (Williams et al., 2006). I aimed to have findings that could be efficiently summarized and interpreted for academic, practical and policy purposes.

Childhood obesity. Trained research assistants measured weight in 2003 using a calibrated digital scale to the nearest 0.1 kg (Veugelers & Fitzgerald, 2005). Height was measured to the nearest 0.1 cm using a standard tape measure against a flat wall (Veugelers & Fitzgerald, 2005). As shown in Table 1, categorization of overweight and obesity were based on validated international BMI standards established for children and youth by the International Obese Task Force (Cole, Bellizzi, Flegal, & Dietz, 2000). The standards were based on adult cut-offs for overweight (≥ 25 kg/m2) and obesity (≥ 30 kg/m2), but they were adjusted for the specific age and gender category (Cole et al., 2000). Respondents were categorized 1 (Overweight/Obesity), 0 (Normal Weight) or 9 (Missing). I used these data to examine if children who were considered to have overweight/obesity by international BMI standards (Cole et al., 2000) were more at risk of bullying behaviour involvement.

Table 1
Overweight and obesity BMI cut-offs adjusted for age and gender categories (Cole et al., 2000).

Age (years)	Body mass index 25 kg/m2		Body mass index 30kg/m2	
	Boys	Girls	Boys	Girls
9.0	19.10	19.07	22.77	22.81
9.5	19.46	19.45	23.39	23.46
10.0	19.84	19.86	24.00	24.11
10.5	20.20	20.29	24.57	24.77
11.0	20.55	20.74	25.10	25.42
11.5	20.89	21.20	25.58	26.05
12.0	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13.0	21.91	22.58	26.84	27.76

Bullying behaviours. Questions from the CLASS student survey section: *My Friendships, Self-Esteem, And Behaviour* were used to measure bullying behaviours (being a victim, being a bully, being a bully-victim). The same measure for bullying behaviours was used for all objectives of the study.

Questions to measure bullying behaviours were comprised of two questions: (1) I am bullied by other kids, and (2) I bully other kids. Response choices for the questions ranged from 'never or almost never', 'sometimes' to 'often or almost always.' Respondents who reported 'never or almost never,' (referent) were compared to respondents who either reported being 'often or almost always,' or 'sometimes' involved in bullying behaviours. The measure for bullying behaviours included four categorical variables (being a victim, being a bully, being a bully-victim, and non-involved).

Being a victim was measured from the one-item question, ' I am bullied by other kids.' Respondents who answered 'sometimes' or 'often or almost always' to 'I'm bullied by other kids' and answered 'never or almost never' and/or had a missing response for 'I bully other kids" were classified as 'being a victim'.

Being a bully was measured from the one item question, ‘ I bully other kids.’ Respondents who answered ‘sometimes’ or ‘often or almost always’ to ‘I bully other kids’ and answered ‘never or almost never’ and/or had a missing response for ‘I am bullied by other kids’ were classified as ‘being a bully’.

Being a bully-victim was measured from a combined measure of, ‘I am bullied by other kids,’ and ‘I bully other kids’. Respondents who answered ‘sometimes’ or ‘often or almost always’ to ‘I bully other kids’ and answered ‘sometimes’ or ‘often or almost always’ to ‘I am bullied by other kids” were classified as ‘being a bully-victim’.

Respondents who answered ‘never or almost never’ to ‘I bully other kids’ and ‘I am bullied by other kids’ were classified being ‘not involved’ in bullying behaviours.

Items to measure bullying behaviours are regularly dichotomized in the literature for statistical and logical purposes (Benedict et al., 2015; Kaltiala-Heino et al., 2000). As bullying is commonly defined as an intentional and repeated form of aggression over time against a less powerful person or group by a more powerful person or group (Bogart et al. 2014), I considered the answer ‘sometimes,’ as well as ‘often or almost always’ as a repeated behaviour. Furthermore, the items were dichotomized due to the small sample size of children reporting ‘often or almost always’ to ‘I am bullied by other kids’ and ‘I bully other kids,’ which may have been due to social desirability bias (Olckeno, 2002).

Administrative Health Care Records

The administrative health care records dataset was used to measure physician-diagnosed internalizing disorders. The data were available for service dates ranging from 1990 to 2010. The administrative health care records dataset provided by HDNS gave access to the Medical Services Insurance (MSI) database and the Canadian Institute for

Health Information Discharge Abstract Database (CIHI DAD). Medavie Blue Cross administers MSI for the province of Nova Scotia and records information on administrative information for health care services by a physician who is insured or paid for by the Nova Scotia provincial health-care system.

The CIHI DAD includes records of administration information from each admission to a Nova Scotia hospital and contains patient demographic information (age, gender, location, etc.), physician visits, diagnoses, and performed procedures, service transfers in hospital and speciality services.

Primary physician-diagnosed internalizing disorder. Information on whether a child was diagnosed with a primary physician-diagnosed internalizing disorder was extracted from the information available through administrative health care records. A child was considered to have a primary physician-diagnosed internalizing disorder if he/she was diagnosed by a health care provider, according to the International Classification of Disease, ninth revision (ICD-9) or tenth revision (ICD-10) as having a depressive episode, recurrent or persistent mood disorder, neurotic or anxiety disorder, an acute reaction to severe stress, or an emotional disorder with onset specific to childhood (McMartin et al., 2012). Table 2 outlines the ICD 9/10 codes used to indicate if a child had a primary physician-diagnosed internalizing disorder. The ICD 9/10 codes chosen for inclusion in the study were consistent with past research by McMartin et al. (2012) that previously linked the 2003 CLASS to administrative health care records to examine the temporal relationship between children's diet quality and subsequent physician-diagnosed internalizing disorders. However, I expanded the inclusion criteria to include the general code 269 (Episodic Mood Disorders), and sub-codes of each disease code displayed in

Table 2. It was common for participants to be diagnosed with a sub-code, rather than the generalized disease code, such as being diagnosed with the ICD 9 sub-code 300.02 (Generalized Anxiety Disorder), rather than the general ICD 9 code 300 (Neurotic Disorders). Not including ICD 9/10 sub-codes could under-estimate the prevalence of physician-diagnosed internalizing disorders in the population.

As previously mentioned, the study focused on examining physician-diagnosed internalizing disorders, and did not investigate the association between bullying behaviours and subsequent physician-diagnosed externalizing disorders. My decision to focus on physician-diagnosed internalizing disorders was primarily to be consistent with studies that used the 2003 CLASS administrative health care linked data when measuring mental health outcomes (McMartin et al., 2012). As the cross-sectional component of the study measured internalizing symptoms, the longitudinal section of the study focused on extracting ICD 9/10 codes that were associated with subsequent physician-diagnosed internalizing disorders. Furthermore, it is important to have a reliable definition and categorization strategy across studies for clarity and uniformity; primarily focusing on internalizing disorders is consistent with previously published research that used the 2003 CLASS administrative healthcare linked dataset (McMartin et al., 2012).

Moreover, effort was placed on extracting codes that pertained to internalizing disorders as the data categorisation of ICD 9/10 codes was relatively intricate in nature due to the number of disease codes pertaining to mental health disorders, inconsistency across the ICD 9 and ICD 10 codebooks, and complexity of dealing with a seven-year observation period. As recent literature indicated that bullying behaviours are primarily related with internalizing problems (Gini & Pozzoli, 2013; Reijntjes et al., 2010;

Takizawa et al., 2014), it was appropriate to place emphasis on understanding the long-term development of these particular behaviours. The limitations of not including externalizing disorders in the study are further considered in the Discussion (Chapter 4).

The number of primary physician-diagnosed internalizing disorders a child had after and before completion of the 2003 CLASS was separated into two distinct variables. Children were considered to have a primary physician-diagnosis of an internalizing disorder after the completion of the 2003 CLASS study if they were diagnosed with at least one primary physician-diagnosed internalizing disorder between 2003-2010. Children were considered to have a previous diagnosis of an internalizing disorder before completion of the 2003 CLASS if they were diagnosed as having at least one primary physician-diagnosed internalizing disorder between 1990-2002. The two variables were considered count variables as a health care provider could diagnose a child with one or more internalizing disorders over their lifetime.

Table 2
ICD 9/10 codes used to indicate if a child had a physician-diagnosed internalizing disorder.

Description	ICD 9	ICD 10
Episodic mood disorders, excluding bipolar disorder, depressive disorder not elsewhere classified, neurotic and anxiety disorders, acute reaction to stress, adjustment reactions, disturbance of emotions specific to childhood and adolescence.	296, 2962, 2963, 311, 300, 308, 309, 313	F32, F33, F34, F38, F39, F40, F41, F42, F43, F48, F92, F93

Sub-codes for each code were included in the analysis (ICD 9, http://en.wikipedia.org/wiki/List_of_ICD-9_codes, ICD 10, http://en.wikipedia.org/wiki/ICD-10)

Confounding variables. Information about socioeconomic factors, such as parental/guardian household income, education level, and marital status derived from the home survey section: *Where you live,* and the home survey section: *Your Household* were

adjusted for in the study. In consultation with Dr. Xiuyun Wu (Post-Doctoral Fellow of the ROI4Kids project), I chose these specific variables available through the 2003 CLASS to be considered confounding variables in the study. Past research has frequently adjusted for socio-economic and family characteristics, including gender (Bogart et al. 2014; Fekkes et al. 2006; Kaltiala-Heino et al., 2010; Sigurdson et al., 2015), parental/guardian income (Bogart et al. 2014, Copeland et al. 2013; Lereya et al. 2015), educational level (Bogart et al. 2014; Kaltiala-Heino et al., 2010) and family structure (Bogart et al. 2014; Bond et al., 2001; Kaltiala-Heino et al., 2010). Furthermore, I adjusted for earlier diagnoses of internalizing disorders by a health care provider prior to 2003, and adjusted for internalizing symptoms for objective 2. Adjustment for previous mental health diagnoses (Copeland et al., 2013; Lereya et al. 2015) and early symptoms of poor mental health (Kim & Leventhal, 2006; Lereya et al. 2015; Sourander et al., 2009; Wolke et al., 2013) has been performed in past studies to comprehensively understand the interconnected relationships between bullying behaviours and poor mental health. These variables may distort the outlined objectives and therefore be a threat to internal validity (Field, 2009).

Household Income. Parental/guardian income was based on the question, (1) What is your current household income from all sources? (Less than $10,000, $10,000 to $20,000, 20,001 to $30,000, $30,001 to $40,000, $40,001 to $50,000, $50,001 to $60,000, Don't know, No Response). I categorized parental income into 1 (Less than 20,000) 2 (20,001 - 60,000) 3 (More than 60,000), and 9 (Missing).

Education. Parental/guardian education was derived from the question, (1) What is the highest level of education that you have received? (No schooling, Elementary,

Secondary, Community College/Technical College, University, Graduate University). I categorized responses into 1 (Secondary or Less) 2 (College) 3 (University) and 9 (Missing).

Marital status. Parental/Guardian Marital status was based on the question, (1) What is your current marital status? (Married, Living Common-Law, Separated, Divorced, Widowed, Single/Never married, Prefer not to answer). I dichotomized answer choices into 1(Married/Common-Law) and 0 (Separated, Divorced, Widowed, Single/Never married/Prefer not to answer) and 9 (Missing).

Objective 1

Study design. Objective 1 used a cross-sectional design to examine the association between internalizing symptoms and bullying behaviours. A cross-sectional study design is when the primary exposure variables and outcome variables are collected and analyzed at one specific time point in the sample population (Oleckno, 2002). The exposure of interest was the measure of internalizing symptoms, and the outcomes of interest were whether a child indicated being a victim, being a bully, or being a bully-victim. Variables that may affect the association between internalizing symptoms and bullying behaviours were taken into consideration. Questions on children's gender and socio-economic factors (parental/guardian household income, education, marital status) were considered. There was no question associated with age, as all students who completed the survey were between the ages of 10-11 years. In addition, the number of previous physician-diagnosed internalizing disorders a child had prior to 2003 was adjusted for in the analysis. Controlling for the number of physician-diagnosed internalizing disorders a child had prior to completion of the 2003 CLASS assisted in

further understanding the direct association between internalizing symptoms and bullying behaviour involvement.

Sub-objective 1

Study design. Sub-objective 1 used a cross-sectional design to examine other factors (e.g. childhood obesity, peer relationships) that may have an association with bullying behaviours. The exposures of interest were the measures of childhood obesity and the measure of peer relationships. The outcomes of interest were if a child reported being a victim, being a bully, or being a bully-victim. Confounding variables such as internalizing symptoms, gender, and socioeconomic factors (parental/guardian household income, education level, marital status) that might have affected the association were taken into consideration. Furthermore, the number of primary physician-diagnosed internalizing disorders a child had prior to 2003 was adjusted for in the data analysis.

In consultation with the supervising committee it was agreed that for the cross-sectional component of the study (Objective 1 and Sub-Objective 1) the outcome variable would be children's bullying behaviours (being a victim, being a bully and being a bully-victim) rather than being considered exposure variables. As cross-sectional studies are unable to infer if the outcome variable followed the exposure variable or vice versa (Field, 2009; Oleckno, 2002), this component of the study only examined a snapshot of what exposure variables were associated with bullying behaviour involvement. From a population health perspective, it is important to understand what factors are influencing bullying behaviours to further educate health practitioners and policymakers on what contributors may make children at a heightened risk of bullying behaviour involvement. Arseneault et al. (2010) emphasized that researchers need to identify early factors that

may influence a child's risk of being victimized in order to break the cycle of bullying behaviours among vulnerable children.

As Objective 2 used a longitudinal prospective cohort design to examine the temporal relationship between bullying behaviours and long-term internalizing problems, I used this opportunity to comprehensively understand if being part of bullying behaviours can have direct detrimental effects on children's mental health outcomes.

Objective 2

Study design. Objective 2 used a prospective cohort design to examine the temporal relationship between bullying behaviours and the number of subsequent physician-diagnosed internalizing disorders a child had. A prospective cohort design requires the primary exposure variable to be determined in a sample population before the onset of the outcome variable (Oleckno, 2002). A prospective cohort design was appropriate for objective 2 in order to understand the long-term effects of bullying behaviours on physician-diagnosed internalizing disorders, as defined by administrative health care records. Moreover, the study design supported a temporal relationship that could be generalized to a larger population (Creswell, 2014), without determining a cause-effect relationship (Oleckno, 2002).

The exposure of interest was childhood bullying behaviours from the 2003 CLASS survey. Survey data were linked to administrative health care records by HDNS to track the number of primary physician-diagnosed internalizing disorders a participant had over a seven-year timespan after completing the 2003 CLASS survey. The outcome variable was the number of primary physician-diagnosed internalizing disorders a child had in 2003 to 2010.

The analyses for objective 2 adjusted for potential confounding variables that could impact the relationship between bullying behaviours and subsequent physician-diagnosed internalizing disorders. The confounding variables included the measure of internalizing symptoms, gender, and socio-economic factors (parental/guardian household income, education level, marital status). Furthermore, the analysis was adjusted for the number of previous primary physician-diagnosed internalizing disorders a child had before 2003.

Figure 1 visually outlines the timeline and connection between objective 1, sub-objective 1 and objective 2.

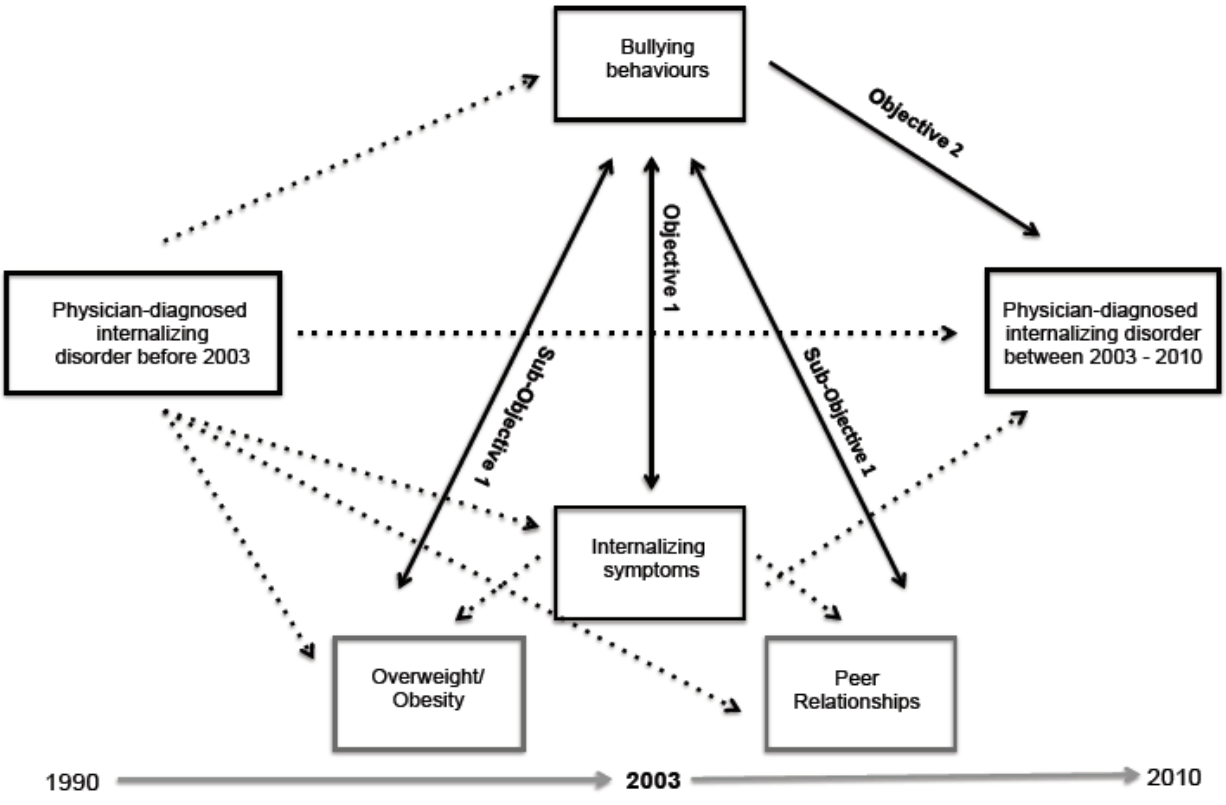

Figure 1 Diagram of the relationship between objective 1, sub-objective 1, and objective 2 study designs.

Ethical Considerations

Veugelers first submitted and obtained ethical approval for the 2003 CLASS study from the Health Sciences Human Research Ethics Board at Dalhousie University. After Veugelers relocated, the study received approval from the University of Alberta Research Ethics Board. Veugelers and the 2003 CLASS research team were granted permission for data collection at the participating school boards. Parental consent forms were distributed and completed for the grade five students participating in the study.

The current study linking the 2003 CLASS to Nova Scotia administrative health care records is part of a larger five-year cross-university collaborative project funded by a Collaborative Research and Innovation Opportunities (CRIO) granted through Alberta Innovative Health Solutions. The University of Alberta Research Ethics Board, the Dalhousie University Research Ethics Board, and the Health Data Nova Scotia Data Access Committee approved the study and data linkage.

Confidentiality considerations. Access to the 2003 CLASS data and administrative health care records required adherence to principles for confidential handling of the data. The linked CLASS administrative health care records dataset was only accessed through Health Data Nova Scotia (HDNS) at Dalhousie University. HDNS has designated office space for data analysis and their own procedures for confidentiality of the data. The research study abided by the procedures of HDNS. The linked CLASS administrative health care records dataset was never taken out of HDNS and was not shared with others.

Disclosure considerations. Permission from the CRIO principal investigator (Veugelers) and HDNS are required prior to any presentations and publications that include the secondary data of the 2003 CLASS survey and the CLASS administrative health care records dataset. Presentations and publications of the data and findings will never include information about identification including names of participants, schools, and geographic information. Small data cells of less than five will not be published due to the chance of participant identification.

Statistical Analysis

Objective 1. Descriptive statistics for demographic information, exposure variables, and survey questions by the outcome variables (being a victim, being a bully, being a bully-victim) were calculated. The cross-sectional association between internalizing symptoms and being a victim, being a bully, and being a bully-victim were examined using a series of logistic regression models, adjusting for the random effects that may occur due to the nested case structure of the observations being examined within schools. Non-response weights were calculated based on household income to determine population-level provincial estimates. Each form of bullying behaviour (being a victim, being a bully, being a bully victim) was analysed separately. Logistic regression models were reported as odd ratios (OR). OR represent the probability of the outcome variable occurring based on the presence of the exposure variable compared to the odds of the outcome variable occurring in the absence of the exposure variable (Field, 2009). Unadjusted and adjusted logistic regression models were carried out. Models were adjusted for the number of primary physician-diagnosed internalizing disorders a child

had before 2003 (between 1990-2002). Furthermore, the models were adjusted for gender, parental/guardian household income, education level and marital status.

Sub-objective 1. The cross-sectional association between childhood obesity and being a victim, being a bully or being a bully-victim, as well as the association between peer relationships and being a victim, being a bully, or being a bully-victim were examined using logistic regression models. Unadjusted and adjusted logistic regressions models were carried out. Models were adjusted for internalizing symptoms and number of primary physician-diagnosed internalizing disorders a child had prior to 2003 (between 1990 - 2002), gender, parental/guardian household income, education level, and marital status. Assumptions for logistic regression models were met for objective 1 and sub-objective 1 (Stoltzfus, 2011).

Objective 2. Descriptive statistics were calculated for demographic information, the exposure variable, and survey questions by the outcome variable (number of primary physician-diagnosed internalizing disorders between 2003-2010). The relationship between bullying behaviours and number of primary physician-diagnosed internalizing disorders between 2003-2010 was examined using negative binomial regression models that were adjusted for observations clustered in schools. Non-response weights were calculated by household income for provincial population-level estimates. The distribution of the number of primary physician-diagnosed internalizing disorders between 2003-2010 was right skewed. The distribution showed over-dispersion, and therefore negative binomial regression was chosen instead of Poisson regression as it exceeded the variance that would be assumed by a Poisson regression (Field, 2009).

Negative binomial regression models were reported as incident rate ratios (IRR). IRR measure the ratio of the probability of the outcome variable occurring based on presence of an exposure variable in comparison to the absence of an exposure variable (Oleckno, 2002). Unadjusted and adjusted negative binomial regression models were carried out. The IRR were adjusted for the number of primary physician-diagnosed internalizing disorders a child had before 2003 CLASS (1990-2002). Furthermore, the IRR were adjusted for internalizing symptoms, gender, parental/guardian household income, educational level, and marital status.

Exploratory data analysis for all objectives was conducted to examine if excluding children who were diagnosed with a primary physician-diagnosed internalizing disorder before 2003 would alter the stated relationships.

Missing. Observations were dropped if there were missing data for both items pertaining to bullying behaviour involvement ('I am bullied by other kids' and 'I bully others') (n = 42). Missing values for other variables (internalizing symptoms, peer relationships, overweight/obesity, parent/guardian household income, education level, marital status) were considered their own category in the analyses.

Software. Statistical analysis was conducted using STATA/SE 13.0 statistical software package (Stata Corp., College Station, TX, USA). Data was securely held and analyzed at HDNS at Dalhousie University. The level of significance was set at $p < 0.05$.

Chapter 4: Results

Descriptive statistics of the population are displayed in Table 3. Of the grade five students in 2003, 33.23% of the children reported being involved in some form of bullying behaviours. When broken down by sub-type, 24.41% of children reported being a victim, 4.32% reported being a bully, 4.51% reported being a bully-victim and 66.74% reported being non-involved (Table 3). Descriptive analysis indicated that 24.12% of grade five students were considered to have a primary diagnosis of an internalizing disorder by a health care provider between 2003-2010 (Table 3).

Table 3
Descriptive statistics of population: Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

Bullying Behaviours	Population (%)
Non-Involved	
Victims	66.74
Bullies	24.41
Bully-victims	4.34
Internalizing symptoms	4.51
Low internalizing symptoms	60.54
High internalizing symptoms	36.96
Missing	2.50
Body weight	
Normal weight	53.57
Overweight/obese	26.29
Missing	20.14
Peer relationships	
Good peer relationships	55.95
Poor peer relationships	36.27
Missing	7.78
Physician-diagnosed internalizing disorder before 2003	
No	89.65
Yes	10.35
Gender	
Boy	48.99
Girl	51.01
Parent/ guardian education	
Secondary or less	35.08
College	21.62
University	36.56
Missing	6.74
Household income	
20, 000 or less	9.07
20, 001 to 60,000	37.66
More than 60,000	30.27
Missing	23.00
Parent/guardian marital status	
Single/divorced/separated/widowed	17.43
Married/common-law	75.84
Missing	6.72

* Column Percentage

Objective 1: Demographics

Descriptive statistics for demographics and exposure variables by bullying behaviours (being a victim, being a bully, being a bully-victim, non-involved) are displayed in Table 4. Descriptive analysis indicated that there were a greater proportion of children involved in all forms of bullying behaviour (being a victim, being a bully, being a bully-victim) if they reported being a boy, were categorized as having high internalizing symptoms, had a primary physician-diagnosed internalizing disorder prior to completion of the 2003 CLASS, were categorized as having poor peer relationships, parents/guardians who had lower household incomes, and were single, divorced, separated, and/or widowed (Table 4). Additionally, there were a greater proportion of children who had overweight/obesity who indicated they were a victim, and a bully-victim, compared to those who reported they were a bully or not involved in bullying behaviours (Table 4).

Table 4

Descriptive statistics for demographics and exposure variables by bullying behaviours, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Victim (%)	Bully (%)	Bully-Victim (%)	Non-Involved (%)
	24.41	4.34	4.51	66.74
Gender				
Boy	26.15	6.09	6.23	61.53
Girl	22.72	2.66	2.87	71.75
Internalizing symptoms				
Low internalizing symptoms	17.76	3.40	1.59	77.25
High internalizing symptoms	34.76	5.79	9.25	50.20
Physician-diagnosed internalizing disorder before 2003				
No	24.05	4.24	4.24	67.47
Yes	27.61	5.23	6.95	60.21
Body weight				
Normal weight	23.46	4.84	4.17	67.53
Overweight/obese	28.66	3.86	4.86	62.62
Peer relationships				
Good peer relationships	16.50	3.58	3.05	76.87
Poor peer relationships	37.02	5.21	6.96	50.81
Parent/ guardian education				
Secondary or less	25.26	5.28	5.04	64.42
College	25.83	3.92	4.10	66.15
University	23.39	3.37	4.53	68.71
Household income				
20, 000 or less	31.37	7.06	7.59	53.98
20, 001 to 60,000	25.75	4.42	5.05	64.78
More than 60,000	20.51	3.07	2.44	73.98
Parent/guardian marital status				
Single/divorced/separated/widowed	26.99	6.23	5.62	61.16
Married/common-law	24.12	3.75	4.35	67.78

* Row percentage

Objective 1: Cross-sectional association between Internalizing Symptoms and Bullying Behaviours

As outlined in Table 5, and 6, there was a statistically significant association between internalizing symptoms, and being a victim, being a bully and being a bully-victim. Table 5 shows an unadjusted significant association between internalizing symptoms and being a victim (OR = 3.12, 95% CI = 2.66, 3.65), being a bully (OR = 2.65, 95% CI = 1.94, 3.63) and being a bully-victim (OR = 10.83, 95% CI = 7.32, 16.01). The adjusted model for all confounding variables in Table 6 indicates that children who were categorized as having high internalizing symptoms had a higher probability to be a victim (OR = 3.13, 95% CI = 2.68,3.66), be a bully (OR = 2.81, 95% CI = 2.04, 3.89), and be a bully-victim (OR = 11.99, 95% CI = 7.73, 18.59) compared to children who were categorized as having low internalizing symptoms. Furthermore, the adjusted model indicates that a small percentage of children with missing information for internalizing symptoms (2.50%) were more likely to be a victim (OR = 2.54 , 95% CI = 1.65, 3.91), be a bully (OR = 3.01, 95% CI = 1.29, 7.02), and a bully-victim (OR = 5.45 , 95% CI = 2.06, 14.41) compared to children with low internalizing symptoms.

Table 5
OR and 95% CI of association between internalizing symptoms and bullying behaviours, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High internalizing symptoms	3.12 (2.66, 3.65)*+	2.65 (1.94, 3.63)*+	10.83 (7.32, 16.01)*+
Missing	2.50 (1.63, 3.82)*+	2.66 (1.24, 5.70)*+	4.93 (1.90, 12.74)*+

* p<0.05
+ Increased probability of outcome variable compared to referent group

Table 6
OR and 95% CI of association between internalizing symptoms, and bullying behaviours when adjusting for all confounding variables, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High internalizing symptoms	3.13 (2.68,3.66)*+	2.81 (2.04, 3.89)*+	11.99 (7.73, 18.59)*+
Missing	2.54 (1.65,3.91)*+	3.01 (1.29, 7.02)*+	5.45 (2.06, 14.41)*+
Physician-diagnosed internalizing disorder before 2003	1.05 (1.00,1.10)*+	0.99 (0.88,1.10)	1.08 (0.93,1.24)
Gender			
Boys	1.00	1.00	1.00
Girls	0.68 (0.59, 0.78)*–	0.33 (0.23,0.48)*–	0.28 (0.20, 0.41)*–
Parent/guardian education			
Secondary or less	1.00	1.00	1.00
College	1.14 (0.94, 1.39)	0.81 (0.53, 1.25)	0.86 (0.52,1.41)
University	0.95 (0.79, 1.42)	0.59 (0.40, 0.85)*–	0.87(0.58, 1.33)
Missing	0.65 (0.25, 1.70)	0.71 (0.24, 2.08)	0.19 (0.02, 1.59)
Household income			
20, 000 or less	1.00	1.00	1.00
20, 001 to 60,000	0.71 (0.53, 0.95)*–	0.66 (0.40, 1.12)	0.56 (0.33, 0.96)*–
More than 60,000	0.55 (0.40, 0.75)*–	0.47 (0.27, 0.83)*–	0.25 (0.14, 0.45)*–
Missing	0.79 (0.57, 1.09)	0.69 (0.37, 1.28)	0.68 (0.37, 1.23)
Parent/guardian marital status			
Single/divorced/separated/widowed	1.00	1.00	1.00
Married/common-law	1.03 (0.82, 1.28)	0.74 (0.50, 1.10)	1.29 (0.78, 2.14)
Missing	1.21 (0.43, 3.41)	1.20 (0.44, 3.28)	3.04 (0.38, 24.29)

* $p<0.05$
+ Increased probability of outcome variable compared to referent group
– Decreased probability of outcome variable compared to referent group

The association between internalizing symptoms and being a victim, being a bully, and being a bully-victim was observed to be similar after excluding children who had a primary physician-diagnosed internalizing disorder before 2003 (N = 481) (Appendix G, Table G4).

Sub-objective 1: Cross-sectional association between Overweight/Obesity, Peer Relationships and Bullying Behaviours

Overweight/Obesity. The unadjusted and adjusted models for the association between children who had overweight/obesity and being a victim, being a bully, and being a bully-victim are displayed in Tables 7, and 8. The adjusted model for all confounding variables in Table 8 indicates that children who had overweight/obesity had a higher probability of being a victim (OR = 1.21, 95% CI = 1.03, 1.42) compared to children who had normal weight. Overweight/obesity was not statistically significant for being a bully (OR = 0.79, 95% CI = 0.53, 1.17), or being a bully-victim (OR = 1.01, 95% CI = 0.66, 1.54).

Table 7
OR and 95% CI of association between overweight/obesity and bullying behaviours, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Body weight			
Normal weight	1.00	1.00	1.00
Overweight/obese	1.32 (1.12,1.56)*+	0.83 (0.56,1.21)	1.18 (0.81,1.71)
Missing	0.86 (0.67, 1.09)	0.70 (0.42, 1.16)	1.03 (0.66, 1.60)

*p < 0.05
+ Increased probability of outcome variable compared to referent group

Table 8
OR and 95% CI of association between overweight/obesity and bullying behaviours when adjusting for all confounding variables, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Body weight			
Normal weight	1.00	1.00	1.00
Overweight/obese	1.21 (1.03, 1.42)*+	0.79 (0.53,1.17)	1.01 (0.66, 1.54)
Missing	0.87 (0.68, 1.12)	0.67 (0.38, 1.18)	1.23 (0.70, 2.15)
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High Internalizing symptoms	3.08 (2.64, 3.60)*+	2.80 (2.03, 3.87)*+	12.06 (7.77, 18.71)*+
Missing	2.58 (1.68, 3.96)*+	3.00 (1.29, 7.00)*+	5.34 (2.03, 14.04)*+
Physician-diagnosed internalizing disorder before 2003	1.05 (1.00, 1.11)*+	0.99 (0.89, 1.10)	1.08 (0.93, 1.24)
Gender			
Boys	1.00	1.00	1.00
Girls	0.68 (0.59, 0.79)*–	0.34 (0.23,0.48)*–	0.28 (0.20, 0.40)*–
Parent/guardian education			
Secondary or less	1.00	1.00	1.00
College	1.14 (0.94, 1.39)	0.81 (0.53, 1.26)	0.86 (0.52, 1.40)
University	0.95 (0.79, 1.14)	0.59 (0.40, 0.87)*–	0.87 (0.57, 1.32)
Missing	0.68 (0.26, 1.78)	0.77 (0.25, 2.35)	0.18 (0.02, 1.57)
Household income			
20, 000 or less	1.00	1.00	1.00
20, 001 to 60,000	0.71 (0.53, 0.95)*–	0.67 (0.40, 1.12)	0.56 (0.33,0.95)*–
More than 60,000	0.55 (0.40, 0.76)*–	0.46 (0.26, 0.82)*–	0.25 (0.14, 0.45)*–
Missing	0.78 (0.56, 1.09)	0.69 (0.37, 1.29)	0.68 (0.37, 1.23)
Parent/guardian marital status			
Single/divorced/separated/widowed	1.00	1.00	1.00
Married/common-law	1.02 (0.82, 1.27)	0.72 (0.48, 1.08)	1.30 (0.79, 2.16)
Missing	1.22 (0.43, 3.43)	1.19 (0.42, 3.31)	3.09 (0.38, 25.26)

*p <0.05
+ Increased probability of outcome variable compared to referent group
– Decreased probability of outcome variable compared to referent group

There was no association between having overweight/obesity and being a victim, being a bully and being a bully-victim after excluding children who had a physician-diagnosed internalizing disorder prior to 2003 (n = 481) (Appendix G, Table G6).

Peer Relationships. The unadjusted and adjusted models for the association between peer relationships and being a victim, being a bully and being a bully-victim are outlined in Tables 9 and 10. The adjusted model for all confounding variables in Table 10 indicates that there is a statistically significant association between children who were categorized as having poor peer relationships and being a victim (OR = 2.72, 95% CI = 2.33, 3.18), being a bully (OR = 1.60, 95% CI = 1.13, 2.27) and being a bully-victim (OR = 2.08, 95% CI = 1.49, 2.91) compared to children who were categorized as having good peer relationships.

Table 9
OR and 95% CI of association between peer relationships and bullying behaviours, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Peer relationships			
Good peer relationships	1.00	1.00	1.00
Poor peer relationships	3.48 (3.00, 4.04)*+	2.22 (1.60, 3.07)*+	3.35 (2.503, 4.48)*+
Missing	1.50 (1.12, 2.02)*+	1.84 (1.10, 3.06)*+	0.97 (0.47, 2.00)

*p < 0.05
+ Increased probability of outcome variable compared to referent group

Table 10
OR and 95% CI of association between peer relationships and bullying behaviours when adjusting for all confounding variables, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Peer relationships			
Good peer relationships	1.00	1.00	1.00
Poor peer relationships	2.72 (2.33, 3.18)*+	1.60 (1.13, 2.27)*+	1.89 (1.35, 2.65)*+
Missing	1.55 (0.78, 3.06)	0.67 (0.20, 2.27)	0.84 (0.20, 3.43)
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High Internalizing symptoms	2.56 (2.19, 3.00)*+	2.62 (1.86, 3.67)*+	10.66(6.71,16.94)*+
Missing	2.30 (1.48, 3.54)*+	2.86 (1.29, 6.36)*+	5.19 (2.00, 14.46)*+
Physician-diagnosed internalizing disorder before 2003	1.04 (1.01, 1.08)*+	0.98 (0.88, 1.10)	1.07 (0.94, 1.22)
Gender			
Boys	1.00	1.00	1.00
Girls	0.73 (0.62, 0.85)*-	0.34 (0.23, 0.49)*–	0.29 (0.20, 0 .41)*–
Parent/guardian education			
Secondary or less	1.00	1.00	1.00
College	1.17 (0.95, 1.44)	0.83 (0.53, 1.29)	0.89 (0.54, 1.46)
University	1.01 (0.83, 1.22)	0.60 (0.41, 0.87)*–	0.94 (0.62, 1.43)
Missing	0.68 (0.23, 1.98)	0.82 (0.27, 2.50)	0.25 (0.03, 2.38)
Household income			
20, 000 or less	1.00	1.00	1.00
20, 001 to 60,000	0.80 (0.60, 1.06)	0.68 (0.41, 1.13)	0.61 (0.36,1.04)
More than 60,000	0.65 (0.48, 0.89)*-	0.49 (0.28, 0.86)*–	0.28 (0.16, 0.51)*–
Missing	0.88 (0.63, 1.21)	0.71 (0.39, 1.29)	0.75 (0.41, 1.34)
Parent/guardian marital status			
Single/divorced/separated/ widowed	1.00	1.00	1.00
Married/common-law	1.03 (0.82, 1.28)	0.74 (0.49, 1.11)	1.27 (0.77, 2.10)
Missing	1.20 (0.37, 3.91)	1.86 (0.57, 6.08)	3.85 (0.38, 38.64)

*$p < 0.05$
+ Increased probability of outcome variable compared to referent group
– Decreased probability of outcome variable compared to referent group

The association between peer relationships and being a victim, being a bully and being a bully-victim is observed to be similar after excluding children who had a physician-diagnosed internalizing disorder prior to completion of the 2003 CLASS (n = 481) (Appendix G, Table G8).

Objective 1 and sub-objective 1 analysis indicated that there was a significant association between specific confounding variables and bullying behaviour involvement (being a victim, being a bully, being a bully-victim). Children who were previously diagnosed with a physician-diagnosed internalizing disorder prior to the 2003 compared to children who did not have a previous diagnosis had greater odds of being a victim. Girls were less likely than boys to be involved in all forms of bullying behaviour involvement (being a victim, being a bully being a bully-victim) and children whose household income was more than 60,000 were less likely to be involved in bullying behaviours compared to children whose household income was less than 20,000. Children who had a parent/guardian complete university were less likely to be a bully compared to children whose parents only completed secondary school or less.

Objective 2: Demographics

Descriptive statistics for exposure variables and demographic variables are outlined in Table 11. There were a higher percentage of girls that were diagnosed with a physician-diagnosed internalizing disorder (27.89%) compared to boys (20.20%). A greater proportion of children who reported they were victims of bullying in grade five had a primary physician-diagnosed internalizing disorder between 2003-2010 (29.54%) compared to children who reported being a bully (21.02%), being a bully-victim (27.93%) or not being involved in bullying behaviours (22.09%). As shown in Table 11, a greater proportion of children who were categorized as having high internalizing symptoms, having poor peer relationships, parents/guardians who had a lower household income, lower education level, and were separated/divorced/single/widowed were found

to have a primary diagnosis of an internalizing disorder by a health care provider over a seven-year timespan.

Table 11

Descriptive statistics of demographic and exposure variables by having an internalizing disorder between 2003-2010, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Internalizing disorder between 2003-2010 (%)	
	Yes	No
	24.12	75.88
Bullying behaviours		
Not involved	22.09	77.91
Being a victim	29.54	70.46
Being a bully	21.02	78.98
Being a bully-victim	27.93	72.07
Physician-diagnosed internalizing disorder before 2003		
No	22.04	77.96
Yes	42.19	57.81
Gender		
Boys	20.20	79.80
Girls	27.89	72.11
Internalizing symptoms		
Low internalizing symptoms	21.78	78.22
High internalizing symptoms	29.76	70.24
Body weight		
Normal weight	24.93	75.07
Overweight/obese	24.19	75.81
Peer relationships		
Good peer relationships	20.18	79.82
Poor peer relationships	29.94	70.06
Parent/guardian marital status		
Single/divorced/separated/widowed	29.81	70.19
Married/common-Law	22.77	77.23
Parent/ guardian education		
Secondary or less	27.29	72.71
College	22.28	77.72
University	21.97	78.03
Household income		
20,000 or less	34.13	65.87
20,001 to 60,000	25.44	74.56
More than 60,000	19.80	80.20

*Row percentage

Objective 2: Longitudinal relationship between Bullying Behaviours and Physician-diagnosed Internalizing Disorders

As outlined in Table 12 and 13, incidence rate ratios (IRR) were calculated for the unadjusted and adjusted relationship between childhood bullying behaviours (being a victim, being a bully, being a bully-victim) and number of primary physician-diagnosed internalizing disorders a child had between 2003-2010. The unadjusted model in Table 12 indicates that children who were victims of bullying compared to children who were not involved in any form of bullying behaviour had a significantly higher rate of receiving a primary physician-diagnosed internalizing disorder between 2003-2010 (IRR = 1.42, 95% CI = 1.14, 1.78). Children who were bullies compared to children who were not involved had a significantly lower rate of receiving a primary physician-diagnosed internalizing disorder between 2003-2010 (IRR = 0.68, 95% CI = 0.46, 1.00), while there was no significant relationship between being a bully-victim and number of primary physician-diagnosed internalizing disorder a child had between 2003- 2010 (IRR = 1.52, 95% CI = 0.98, 2.36) compared to children who were not involved. The adjusted model for all confounding variables in Table 13 illustrates consistent results, such that children who were victims of bullying compared to children who were not involved in any form of bullying behaviour had a significantly higher rate of receiving a primary diagnosis of an internalizing disorder by a health care provider between 2003-2010 (IRR = 1.38, 95% CI = 1.11, 1.70). Children who were bullies compared to children who were not involved in any form of bullying behaviours had a significantly lower rate of receiving a primary physician-diagnosed internalizing disorder between 2003-2010 (IRR = 0.67, 95% CI = 0.46, 0.99) and there was no significant relationship between being a bully-victim and

number of primary physician-diagnosed internalizing disorder a child had between 2003-2010 (IRR = 1.35, 95% CI = 0.84, 2.14) compared to children who reported not being involved in bullying behaviours.

Table 12
IRR and 95% CI of the relationship between bullying behaviours and number of primary diagnoses of an internalizing disorder by a physician between 2003-2010, Grade five students, Childr School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	IRR (95% CI)
Bullying behaviours	
Not involved	1.00
Being a victim	1.42 (1.14,1.78)*+
Being a bully	0.68 (0.46,1.00)* –
Being a bully-victim	1.52 (0.98, 2.36)

*p <0.05
+ Increased rate of outcome variable compared to referent group
– Decreased rate of outcome variable compared to referent group

Table 13
IRR and 95% CI of the relationship between bullying behaviours and number of primary diagnoses of an internalizing disorder by a physician between 2003-2010 after adjusting for all confounding variables, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	IRR (95% CI)
Bullying behaviours	
Not Involved	1.00
Being a victim	1.38 (1.11, 1.70)*+
Being a bully	0.67 (0.46, 0.99)*–
Being a bully-victim	1.35 (0.84, 2.14)
Physician-diagnosed internalizing disorder before 2003	1.32 (1.05, 1.65)*+
Internalizing symptoms	
Low internalizing symptoms	1.00
High internalizing symptoms	1.42 (1.16, 1.73)*+
Missing	0.83 (0.55, 1.26)
Gender	
Boys	1.00
Girls	1.59 (1.33, 1.91)*+
Parent/guardian education	
Secondary or less	1.00
College	0.79 (0.60, 1.06)
University	0.79 (0.65, 0.97)*–
Missing	4.78 (1.34, 17.00)*+
Household income	
20, 000 or less	1.00
20, 001 to 60,000	0.90 (0.67, 1.22)
More than 60,000	0.73 (0.52, 1.03)
Missing	0.66 (0.48, 0.93)*–
Parent/guardian marital status	
Single/divorced/separated/widowed	1.00
Married/common-law	0.91 (0.70, 1.19)
Missing	0.22 (0.06, 0.81)*–

*$p < 0.05$
+ Increased rate of outcome variable compared to referent group
– Decreased rate of outcome variable compared to referent group

The relationship between childhood bullying behaviours (being a victim, being a bully, being a bully-victim) and number of primary physician-diagnosed internalizing disorders between 2003-2010 is observed to be similar after excluding children who had

a primary physician-diagnosed internalizing disorder before 2003 (n = 481) (Appendix G, G12)

In addition, Objective 2 analyses indicated that specific confounding variables were significantly related to having a subsequent physician-diagnosed internalizing disorder over a seven-year timespan. Children who had a physician-diagnosed internalizing disorder before 2003 compared to children who did not have a physician-diagnosed internalizing before 2003, had high internalizing symptoms compared to low internalizing symptoms, were girls rather than boys, had a significantly higher rate of being diagnosed with an subsequent physician-diagnosed internalizing disorder (Table 13). Children who had a parent/guardian attend university had a significantly lower rate of having future physician-diagnosed internalizing disorder compared to children who had a parent/guardian attend secondary school or less (Table 13).

Moreover, specific missing categories had a statistically significant relationship with having a physician-diagnosed internalizing disorder between 2003-2011. Children had an increased rate of having a physician-diagnosed internalizing disorder if they had a parent/guardian who had missing information for education compared to a parent/guardian who compared secondary school or less. On the contrary, children had a decreased rate of having a physician-diagnosed internalizing disorder if the parent/guardian had missing information for household income compared to if the household income was 20,000 or less, and if they had missing information for marital status compared to a parent/guardian reporting they were single/divorced/separated/widowed (Table 13).

Chapter 5: Discussion

The relationship between bullying behaviours and poor mental health is complex and past research strongly supports the link between bullying behaviour involvement and poor mental health (Gini & Pozzoli, 2009; 2013; Hawker & Boulton, 2000, Reijntjes et al., 2010). However, due to the cross-sectional nature of the majority of studies there is limited knowledge if psychological maladjustment can be considered a consequence, as well as a cause of bullying behaviours (Reijntjes et al., 2010).

This study focused on internalizing mental health problems and was comprised of two main objectives using a cross-sectional and prospective cohort design. The study aimed to examine the cross-sectional association between internalizing symptoms and bullying behaviours, as well as examine other factors (e.g. childhood obesity, and peer relationships) that may have an association with bullying behaviour involvement. In addition, the study examined the temporal relationship between bullying behaviours and number of physician-diagnosed internalizing disorders a child had over a seven-year timespan, as defined by administrative health care records.

Objective 1

The prevalence of bullying behaviours in the study population (33.23%) was relatively consistent with past research indicating that 20% to 40% of children report being involved in bullying behaviours (Jenson et al. 2013; Kim et al., 2006; Lereya et al. 2015; Sigurdson et al. 2015; Wolke et al. 2013).

The cross-sectional findings that children who had high internalizing symptoms had a greater probability of being a victim, being a bully, and being a bully-victim is

consistent across past research (Gower & Borowsky, 2013; Houbre, Tarquinio, Thuillier, & Hergott, 2006; Kaltiala-Heino et al., 2000)**.** More specifically, the findings were significant after controlling for the number of primary physician-diagnosed internalizing disorders a child had before 2003, and other confounding variables. This result illustrates that children who encompass high internalizing symptoms, but have not or not yet been diagnosed with an internalizing disorder by a health care provider are at a higher risk of being involved in all forms of bullying behaviors (being a victim, being a bully, being a bully-victim).

Furthermore, the associations were significant after controlling for gender and socio-demographic variables. These findings indicate that children who have high internalizing symptoms have a greater probability of being involved in bullying behaviours across all socio-demographic comparison groups. Past research shows consistent results supporting a direct connection between poor mental health and bullying behaviours after controlling for confounding factors such as gender (Annerbäck et al. 2014; Benedict et al., 2015; Bogart et al., 2014; Fekkes et al., 2006; Kaltiala-Heino et al., 2010; Sigurdson et al., 2015; Slee, 1995) and family characteristics (Annerbäck et al., 2014; Bogart et al., 2014; Kaltiala-Heino et al., 2010; Wolke et al., 2013).

Internalizing symptoms and being a victim. Although the current study found a significant association between internalizing symptoms and all forms of bullying behaviours, past research has primarily focused on the strong cross-sectional association between psychological maladjustment and peer victimization (Lien & Welander-vatn, 2013; Swearer et al. 2001). Research indicates that victims have specific characteristics that make them more receptive to being a target of bullying including symptoms of

depression (Aluede et al., 2008) and anxious tendencies (Swearer et al., 2001). Kaltiala-Heino et al. (2010) theorized that symptoms of depression may impair a child's self-esteem and social skills making them more at risk of being victimized by their peers, and this vicious cycle can increase the risk to be continuously victimized overtime (Reijntjes et al., 2010).

Internalizing symptoms and being a bully. Past studies that have considered the cross-sectional association between internalizing problems and being a perpetrator of bullying show inconsistent results. A group of studies indicate that bullies have high levels of internalizing symptoms (Gini & Pozzoli, 2013; Kaltiala-Heino et al., 2000), while Arslan, Hallett, Akkas, and Akkas, (2012) suggest bullies do not embody strong internalizing symptoms. Consistent with the current findings, past research indicates that internalizing behaviours are not as prominent in bullies compared to victims and bully-victims (Craig, 1998; Gini & Pozzoli, 2013). Previous literature proposes that although bullies may manifest feelings of anxiety and depression, these feelings may be more likely to be expressed through externalizing behaviours, such as in the form of aggression, impulsivity, verbal abuse and the use of drugs and alcohol (Aluede et al., 2008; Gini & Pozzoli, 2013). With the inconsistency in the research on the association between poor mental health and being a bully, Swearer et al. (2001) advised that the bully sub-type may include a wide spectrum of children who may or may not encompass internalizing symptoms.

Internalizing symptoms and being a bully-victim. Studying the association between poor mental health and being a bully-victim is relatively novel and the finding that children with high internalizing behaviours have the greatest likelihood to be a bully-

victim is consistent with past research (Kaltiala-Heino et al., 2000). Research suggests that there is a heightened risk of mental health problems, such as poor psychological and social adjustment, for children who take on the role of a bully and a victim (bully-victim) (Arseneault et al., 2010; Gini & Pozzoli, 2013; Kim & Leventhal, 2006; Kumpulainen, Räsänen, & Henttonen, 1999; Swearer et al., 2001). Cross-sectional studies find that bully-victims report higher levels of poor mental health (Baldry, 2004), such as increased levels of anxious symptoms compared to bullies and non-involved peers (Swearer et al., 2001), and lower self-esteem compared to other sub-types of bullying behaviours (O'Moore & Kirkham, 2001).

Past research supports the study's findings that children who have high internalizing symptoms are more likely to be involved in all forms of bullying behaviours (Gini & Pozzoli, 2013), yet the psychological profile of victims, bullies and bully-victims and how they express their emotions may differ (Aluede et al., 2008; Arseneault et al., 2010). Though objective 1's findings are unable to infer causality, they aid in understanding the association between internalizing symptoms and bullying behaviour involvement. Objective 2 allows us to further examine the psychological consequences of bullying behaviours, by examining the temporal relationship between childhood bullying behaviour involvement and the number of subsequent physician-diagnosed internalizing disorders, as defined by administrative health care records.

Sub-objective 1

The cross-sectional component of the study found that children who had overweight/obesity were more likely to be victims of bullying after controlling for all confounding variables. Moreover, children who had poor peer relationships were found

to be more likely to be involved in all forms of bullying behaviours (being a victim, being a bully and being a bully-victim) compared to children with good peer relationships after controlling for all confounding variables.

Childhood obesity and bullying behaviours. The findings reinforce the notion that children who have overweight/obesity are at an increased risk of being victimized by their peers (Lumeng et al., 2010; Puhl & King, 2013; Wang, Iannotti, & Luk, 2010). Past research supports that there is a direct association between childhood obesity and victimization after adjusting for confounding variables, such as gender (Lumeng et al., 2010; Jansen et al. 2014), socio-demographic factors (Lumeng et al., 2010; Jansen et al. 2014), and race (Lumeng et al., 2010; Puhl & King, 2013). Furthermore, research suggests that feelings of depression, anxiety and low self-esteem may partially account for the association between childhood obesity and victimization (Craig et al., 2010; Giletta et al., 2010). Although mediation analysis was not carried out during the present study, the odds of being victimized for a child who had overweight/obesity decreased after adjusting for internalizing symptoms and number of previous physician-diagnosed internalizing disorders a child had before 2003. Furthermore, the association was non-significant after exploring how excluding children who had a previous physician-diagnosed internalizing disorder would alter the relationship. These findings indicate that psychological maladjustment may play a role in the association between childhood obesity and victimization, but further analysis needs to be conducted. Various studies theorize that lower psychological well-being (Craig et al., 2010; Giletta et al., 2010; Gray, 2008), and worse self-perceptions (Giletta et al., 2010) in children who have obesity may make them more receptive to being victimized (Craig et al., 2010; Giletta et

al., 2010), while other studies show that victimization may heighten the relationship between children who have overweight/obesity and feelings of depression and low self-worth (Lumeng et al., 2010).

In a study by Austin, Haines and Veugelers (2009) that previously used the 2003 CLASS dataset, an association was found between poor body satisfaction and high BMI. Understanding the link between body self-perception and obesity is useful as Craig et al. (2010) argued that obesity alone may not put a child at risk of being victimized, yet perceptions related to weight status may put them at a heightened risk of victimization. However, contrary to this notion, the current study found that there was still a significant association between a child's weight status and being a victim after controlling for early indicators of internalizing problems. Research suggests that weight is a prominent physical feature that can be a target for bullying victimization (Craig et al., 2010; Janssen et al., 2004). The current finding may indicate that despite psychological maladjustment, weight status alone may be a salient physical factor that puts children at an increased risk of being victimized.

Research on the relationship between children who have obesity and being a bully or a bully-victim is scarce and unclear. Our null findings on the association between childhood obesity and being a bully are consistent with recent research using secondary data from 41,361 American youth (ages 10 – 17 years) who completed a cross-sectional National Survey of Children's Health (NSCH) (Stough, Merianos, Nabors, & Peugh, 2016). However, the majority of past research contradicts these findings, and argues that children who have obesity are more likely to be perpetrators of bullying compared to peers who are considered to have normal weight (Craig et al., 2010; Jansen et al., 2014;

Kukaswadia et al., 2011), yet these findings have been shown to vary based on age (Janssen et al., 2004) and type of bullying behaviour, such as physical versus verbal aggression (Craig et al., 2010; Janssen et al., 2004).

As the examination of childhood obesity and bullying behaviours was not the main objective of the study, more in depth analysis of this relationship needs to be examined to determine if there is a direct association between childhood obesity and bullying behaviours or if psychological ramifications and self-perception play a vital role in the connection between obesity and bullying behaviour involvement.

Peer relationships and bullying behaviours. The association between peer relationships and victimization is well studied, and past research suggests that children with poor peer relationships and who lack friends are more likely to be victims of bullying behaviours (Healy et al., 2015; Kochel et al., 2015; Murray-Harvey & Slee, 2010; Papafratzeskakou et al., 2011; Sarkova et al., 2014; Spriggs et al., 2007). This association held true after controlling for internalizing symptoms and number of previous physician-diagnosed internalizing disorders a child had before 2003. The current study suggests that factors involved in poor peer relationships, such as lack of friends, and rejection from classmates may play a direct role in heightening the risk of being a victim. Cook, Williams, Guerra, Kim, and Sadek (2010) indicated that poor social skills are one of the strongest risk factors for being a victim of bullying. On the other end of the spectrum, positive peer relationships are shown to be a protective factor for bullying behaviour involvement (Kochel et al., 2015; Papafratzeskakou et al., 2011) suggesting that peer acceptance, and friendships may reduce the chances of being involved in bullying behaviours despite psychological maladjustment. Boulton et al.'s (1991) short

longitudinal study aimed to examine the "friendship protection hypothesis" and found that children who had reciprocated friends were less likely to be victimized and children who lacked friends were more likely to be victimized. If positive peer relationships can reduce the risk of being involved in bullying behaviours, focus needs to be placed on helping children establish strong social circles and peer support groups.

Furthermore, the current study found a significant association between poor peer relationships and being a bully and being a bully-victim. Consistent with past research, bullies are found to have poor peer relationships (Haynie et al., 2001; Spriggs et al., 2007; Veenstra et al., 2005), but to be less isolated compared to victims and bully-victims (Pellegrini, Bartini, & Brooks, 1999) , while past work has indicated that bully-victims have worse peer acceptance (Kochel et al., 2015), and low social competence (Haynie et al., 2001).

Research on the role that peer relationships play as a predictor of being a bully or a bully-victim is limited. Spriggs et al.'s (2007) study indicated that poor interpersonal and school factors are related to being a bully across racial groups and ethnicities, yet bully-victims did not differ on these factors compared to non-involved peers. However, other research has suggested that bullies are usually popular, likeable and have power over other peers (Aluede et al., 2008; Berger, 2007).

The inconsistency of research examining poor peer relationships as an independent risk factor for bullying behaviours makes it difficult to confirm the role it may have in predicting bullying behaviour involvement. Considering the link found between internalizing symptoms and bullying behaviours in this study, it is assumed that such psychological maladjustment may impact the relationships children hold with their

peers and social circles (Haynie et al., 2001). Further research examining the risk and protective factors that peer relationships play in bullying behaviour involvement is vital as there may be potential implications to know what types of peer relationships can significantly increase or decrease bullying behaviour involvement.

Objective 2

To further understand the consequences of bullying behaviour involvement, a longitudinal component of the study was carried out. This found that children who reported they were victims of bullying had a significantly higher rate of having a primary physician-diagnosed internalizing disorder over a seven-year timespan compared to non-involved peers. By contrast, children who reported they were bullies in grade five had a reduced rate of having a primary diagnosis of an internalizing disorder by a physician, while there was no relationship found between being a bully-victim and having a subsequent physician-diagnosed internalizing disorders.

Of the grade give students in the population, 24.12% of students had a physician-diagnosed internalizing disorder between 2003-2010. Prevalence of long-term diagnoses of internalizing health disorders range from 10% to 20% across the literature (Copeland et al. 2013; Lereya et al. 2015; Sourander et al. 2009), most likely due to diversity in measurements, types of mental health problems classified as internalizing disorders, and the specific sample under investigation. A study by Lereya et al. (2015), that used a self-administered interview to determine subsequent ICD 10 diagnoses of depression/anxiety, found that 17.7% of children were considered to have a diagnosis of depression/anxiety at the age of 18 years. The *Report from the Canadian Disease Surveillance System: Mental Illness in Canada* outlined that the age-standardized prevalence of the primary diagnoses

of a mental health illness by a health care provider in Nova Scotia for 2009/10 was 16.8% and included codes ICD 9 codes 290 to 319 and ICD 10 codes F00 to F99 (Public Health Agency of Canada, 2015). The current study's high prevalence of a primary-diagnosis of an internalizing disorder between the ages of 10 - 11 to 18 by a physician may be due to the age frame under investigation. The Public Health Agency of Canada (2015) report indicated that prevalence of health services for mental health illness for children and adolescents under the age of 20 years rapidly increased between 1996/97 and 2009/2010 with the highest prevalence increase (43.8%) among children age 10-14 years. Furthermore, the high prevalence may be due to the liberal definition of what was considered a physician-diagnosed internalizing disorder in the study. A child was considered to have a subsequent physician-diagnosed internalizing disorder if he/she was recorded as having at least one diagnosis of an internalizing disorder by a physician according to the ICD 9/10 between 2003-2010 as defined in Table 2. Limitations due to using administrative health care records as a measure for physician-diagnosed internalizing disorders is further discussed in the Strengths and Limitations section.

The current study's findings that there is a temporal relationship between being a victim and subsequent internalizing problems is consistent across the growing body of longitudinal studies that have been conducted (Bogart et al., 2014; Bond et al., 2001; Copeland et al., 2013; Kim et al., 2006; Lereya, Copeland, Zammit, & Wolke, 2015; Ronning et al., 2009; Sourander et al., 2000; Sourander et al. 2009; Stapinski et al., 2014; Takizawa et al., 2014; Zwierzynska et al., 2013). However, the majority of past longitudinal studies have used self-report surveys or interview methods to measure subsequent mental health problems (Bond et al., 2001; Copeland et al., 2013; Fekkes et

al., 2006; Kim et al., 2006; Takizawa et al. 2014), while the current study used physician-diagnosed internalizing disorders extracted from administrative health care records for the measure of long-term mental health problems. A similar method of measurement was used in Sourander et al.'s (2009) study that extracted psychiatric hospital treatments (ICD 9/10 disease codes) from the Finnish Hospital Discharge Register. Furthermore, the majority of past longitudinal studies have relativity short observation periods from six months to five years (Arseneault et al., 2010; Bogart et al., 2014; Bond et al., 2001; Fekkes et al., 2006; Kim & Leventhal, 2006; Stapinski et al., 2014), while more extensive longitudinal studies have been beginning to arise in the past five years (Copeland et al., 2013; Lereya et al., 2015; Takizawa, 2014; Sourander et al. 2009; Sigurdson et al. 2015). Moreover, very few of the studies have used a population-based sample (Kaltiala-Heino et al. 2010; Sigurdson et al. 2015; Sourander et al. 2009; Takizawa et al. 2014; Wolke et al. 2013). The current study is able to add to the body of knowledge by having a long observation period, examining mental health outcomes through novel methodologies, and using a population-based sample. In addition, the study adds further information on the mental health consequences of being a bully or being a bully-victim. There are inconsistent results and a dearth of research on the relationship between being a bully or being a bully-victim and long-term internalizing problems (Copeland et al. 2013; Kaltiala-Heino et al. 2010; Kim et al., 2006; Lereya et al. 2015; Ronning et al. 2009; Sigurdson et al. 2015; Sourander et al. 2009; Wolke et al. 2013).

Being a victim and having physician-diagnosed internalizing disorder. The significant relationship between being a victim and subsequent internalizing disorders stays constant after adjusting for measures of internalizing symptoms and number of previous primary physician-diagnosed internalizing disorders a child had before 2003. Due to the prospective cohort design of the objective, this finding supports the notion that there are direct psychological consequences that can arise from being victim of bullying behaviours (Wolke, Lereya, Fisher, Lewis, & Zammit, 2013; Sourander et al., 2009).

In addition, the findings were constant after controlling for gender and socio-economic characteristics implying that long-term mental health consequences related to victimization are detrimental for children across all socio-economic comparison groups in the study. The present finding adds validity to the viewpoint that bullying behaviours are a critical social factor that contributes to the overall mental health and well-being of children across various population sub-sets.

Being a bully and having a physician-diagnosed internalizing disorder. It was unexpected to find that children who reported they were bullies in grade five had a significantly lower rate of being diagnosed with an internalizing disorder over a seven-year timespan compared to their non-involved peers. As indicated in objective 1, cross-sectional studies show contradictory results and the inconsistency in the research holds true for past longitudinal studies that have sought to understand the relationship between being a bully and future mental health outcomes (Copeland et al., 2013; Kelly et al., 2015; Lereya et al., 2015). Some research supports the temporal relationship between being a bully and subsequent internalizing disorders (Sigurdson et al., 2015), while other

work has found no connection after adjusting for other confounding variables (Lereya et al., 2015; Ronning et al., 2009).

Consistent with Lereya's et al.'s (2015) study, the current research only examined the long-term development of internalizing disorders, while bullies may be more likely to have externalizing problems, such as impulsivity, aggression and harmful acts (Kelly et al., 2015; Swearer et al., 2001). Copeland et al.'s (2013) study that measured participants (N = 1,420) during 4 to 6 different time points between ages 9 to 16 years found that children who reported being a bully were only at a heightened risk to develop anti-social personality disorders (externalizing disorder), but did not have a greater risk of developing general internalizing disorders, such as anxiety and depression disorders. Furthermore, previous studies have indicated that there are increased odds of adopting externalizing behaviours among children who are bullies compared to victims and non-involved peers (Arseneault et al., 2010; Kelly et al., 2015; Kumpulainen et al., 1999).

The results should not be interpreted as bullies having better mental health outcomes than their non-involved peers, yet the different pathways through which bullies may express their emotions compared to victims may be different. This interpretation may shed light on why research has yet to conclude a strong link between being a bully and future internalizing problems.

Being a bully-victim and having a physician-diagnosed internalizing disorder.

The findings were unable to confirm a relationship between being a bully-victim and subsequent internalizing disorders, yet past research has suggested that bully-victims tend to encompass both internalizing and externalizing behaviours (Copeland et al., 2013; Swearer et al., 2001; Wolke et al., 2013). As the majority of studies are cross-sectional

(Swearer et al., 2001), further research on the characteristics of bully-victims is needed to comprehensively understand the long-term psychological ramifications that may arise from experiencing both the role of the bully and the victim. The majority of studies have indicated that bully-victims report significantly higher levels of poor mental health later in life (Copeland et al., 2013; Gini & Pozzoli, 2013; Kelly et al., 2015; Wolke et al., 2013), while Sigurdson et al. (2015) did not find a temporal relationship between being a bully-victim and many subsequent health outcomes after controlling for baseline mental health. Sigurdson et al. (2015) proposed that psychological maladjustments in bully-victims may develop into externalizing behaviours such as impulsivity, aggression, and attention deficit problems through the lifetime.

It may be hypothesized that children who reported being a bully or being a bully-victim did not have a higher rate of being diagnosed with a subsequent mental health disorder, as the current study only accounted for internalizing disorders and did not examine externalizing disorders. As mentioned, although bullies and bully-victims may embody internalizing symptoms, some may express these feelings through different emotional outlets and be more likely to be diagnosed with a subset of disease codes that exhibit indicators of externalizing problems by a health care provider. The findings for being a bully and being a bully-victim should also be interpreted with caution due to the low sample size for these two bullying sub-groups. Furthermore, it could be hypothesized that bullies and bully-victims are less likely to seek help from a health care provider, but this notion is yet to be supported by past research (Kumpulainen et al., 1999). To examine whether the rate of physician visits was different across bullying behaviours in our population under investigation, explorative data analysis was

conducted. It was found that bullies and bully-victims did not have a significantly lower rate of physician visits compared to non-involved peers, but victims of bullying had a higher rate of physician visits compared to non-involved peers. Not accounting for externalizing disorders (e.g. Conduct Disorder) may have under-estimated the number of bullies and bully-victims that were diagnosed with a subsequent mental health disorder by a health care provider.

Confounding Variables

Specific confounding variables were significantly related to children's bullying behaviour involvement and rate of having a subsequent physician-diagnosed internalizing disorder. Most interestingly, children who had a primary physician-diagnosed internalizing disorder before 2003 were more likely to be involved in all forms of bullying behaviours compared to children who did not have a physician-diagnosed internalizing disorder before 2003, reinforcing the debated notion that mental health problems could be considered a cause as well as a consequence of bullying behaviour involvement (Reijntjes et al., 2010). Additionally, previous diagnoses before 2003 and internalizing symptoms were related to having a higher rate of having a subsequent physician-diagnosed internalizing disorder. Understandably, this finding is consistent with past research indicating early indicators of mental health problems are a predictor for long-term mental health outcomes (Copeland, Shanahan,Costello, & Angold, 2009; Fichter, Kohlboeck, Wyschkon, & Esser, 2009). Children with a higher household income were less likely to be involved in bullying behaviours, and children who had a parent/guardian who went to university were less likely to be a bully and had a lower rate of having a subsequent internalizing disorder. To further understand what population

subsets are more vulnerable to specific health behaviours and outcomes, it is important that future research continues to examine the social and environmental factors that influence the overall health and well-being of the population.

Missing Variables

Children who had missing information for internalizing symptoms were more likely to be involved in all forms of bullying behaviours. Moreover, children who had a parent/guardian not answer the question pertaining to education level had a higher rate of having a physician-diagnosed internalizing over a seven-year timespan. However, children had a decreased rate of being diagnosed with an internalizing disorder if they had a parent/guardian who neglected to give information on their household income and marital status. There are various reasons why there is missing data in a dataset and they can be categorized into three categories; missing completely at random (MCAR), missing at random (MAR) or missing not at random (MNAR) (Streiner, 2002). As specific missing categories had significant relationships to the outcomes variables it could be interpreted that the data is MNAR, such that their missing information is related to the values that are missing (Streiner, 2002). For instance, children may have neglected to answer questions pertaining to internalizing symptoms as this may be a characteristic of children who have high levels of internalizing symptoms making the missing category a unique predictor that should be taken into consideration. However, there are various other reasons why data can be missing such as the approach of the data collection, interpretation of the survey questions, questions being filled out incorrectly, and mistakes during data imputing (Kuhle, 2015; Streiner, 2002). It is difficult to make inferences into

why missing categories may be significant, therefore caution should be taken when interpreting these findings.

Summary of the Research Findings

The present study found that children experiencing high internalizing symptoms were more likely to be involved in all forms of bullying behaviours (being a victim, being a bully, being a bully-victim) compared to their peers with low internalizing symptoms. Additionally, children who had overweight/obesity were more likely to be a victim, while children who were categorized as having poor peer relationships were more likely to be involved in all forms of bullying behaviour. Children who were victims of bullying behaviours were the only bullying behaviour sub-group with a higher rate of developing a future physician-diagnosed internalizing disorder, as defined by administrative health care records.

The dearth of evidence on the relationship between being a bully, or being a bully-victim and long-term internalizing problems is primarily due to the limited research studies examining the temporal relationship between these bullying behaviour sub-groups using a prospective cohort design with a long observation period.

The findings illustrate a path upon which children who have high internalizing symptoms are more likely to be involved in bullying behaviours, while bullying behaviour involvement can have severe consequences for children's long-term mental health. As the research suggests that internalizing problems and bullying behaviours are prevalent in children across all socio-demographic levels, public health prevention and policy strategies need to place emphasis on limiting bullying behaviour involvement and

distress in children to reduce the development of long-term internalizing mental health problems in the overall population.

Strengths and Limitations

The current study provides strong support for the interconnected link between childhood bullying behaviours and internalizing problems. The cross-sectional nature of objective 1 and sub-objective 1 cannot infer causality, but provides a snapshot of the factors that are associated with bullying behaviour involvement. As the 2003 CLASS is a self-administered survey there is potential for self-report bias, especially in the age group under investigation. Although past research has indicated that self-report is one of the most reliable methods for assessing bullying behaviours (Gini & Pozzoli, 2013; Stapinski et al., 2014), it still relies heavily on self-analysis and may therefore be prone to response bias (Oleckno, 2002) . For example, the lack of terminology and definition of the variables pertaining to bullying behaviours left the questions open to interpretation. A primary limitation of the current study is that the measure used to determine if a child was involved in bullying behaviours only included two items and did not give insight into the frequency and/or type (indirect or direct) of bullying behaviour. The 2003 CLASS only provided information relating to what bullying behaviours the children were involved in (i.e. being a victim, being a bully, being a bully-victim). Swearer et al. (2010) emphasized that due to the diverse methodological measures used to assess bullying behaviours, there are various limitations to consider when interpreting research for practical use. Bullying behaviours, as well as measures of poor mental health, can be assessed using many different forums and approaches, which may yield diverse results across studies.

Furthermore, as the measures of internalizing symptoms and peer relationships are not validated instruments' they need to be interpreted with caution and there may be concerns with internal validity. For example, as I chose to create a new measure (internalizing symptoms) based off items that were originally used to measure self-esteem on the 2003 CLASS, there may be threats to criterion validity (Field, 2009). However, concerns with criterion validity were reduce as a scan of the literature evidently showed that the items are readily used to measure psychological symptoms that expand beyond the construct of self-esteem such as depression, and anxiety.

As the original measure of self-esteem is not used in this study, the study cannot be interpreted in the same light as past studies that have used the 2003 CLASS survey. However, as emphasized in Chapter 2 (Methodology) the choice to re-interpret the original items to measure internalizing symptoms was based off of logical reasoning and background literature in agreement from the committee members.

Despite the limitations of 2003 CLASS, the study has various strengths. The study used a population-based health survey with a good response rate of 51.1%, representative of the population under investigation. The 2003 CLASS survey also used objective measures of height and weight to calculate BMI, instead of self-report for the variable of childhood obesity. Additionally, the 2003 CLASS survey comprised of a number of socio-demographic variables, including parental/guardian household income, education level and marital status that were adjusted for in the study.

Linking the 2003 CLASS data to administrative health records allowed the study to use physician and hospital records between the years of 1990 – 2010. This enabled the study to examine the long-term development of physician-diagnosed internalizing

disorders and control for early diagnoses of internalizing disorders before 2003. A limitation to the research is that the current study only focused on subsequent physician-diagnosed internalizing disorders and did not examine future physician-diagnosed externalizing disorders. Moreover, the current study grouped all physician-diagnosed internalizing disorders codes into one category and did not separate based on code. Further consultation with a psychologist or other expert in the health professions would be needed to separate the codes into specific categories (e.g. Mood Disorders versus Neurotic Disorders) as the codes are categorized, grouped and named differently across the ICD 9 and ICD 10. This limits the study's understanding on the different forms of mental health disorders that may be connected to bullying behaviour involvement and by not including externalizing disorders may of under-estimated the prevalence of mental health disorders in the sample population.

Furthermore, the study was able to control for measures of internalizing symptoms in grade five when exploring the long-term effects of bullying behaviours on subsequent physician-diagnosed internalizing disorders (objective 2). Internalizing symptoms during childhood can be early indicators for the development of a long-term internalizing problems (Copeland et al., 2009; Fichter et al., 2009; National Institute for Mental Health, 2015) and by controlling for these markers, the study was able to examine if being involved in bullying behaviours is an independent risk factor for the development of subsequent internalizing problems.

There remain limitations with the use of administrative health care records (van Walraven & Austin, 2012). Administrative health care record datasets are not primarily created for research purposes and this can impact the completeness and accuracy of the

records. There are many steps that need to be completed before the diagnosis of a mental health disorder is captured in the administrative health care dataset, such as recognition of the disease by a physician and legible documentation by the physician and health records abstractor (van Walraven & Austin, 2012). The validity of the disease code being properly diagnosed and recorded decreases as the steps become more complex and/or numerous. Furthermore, the *Report from the Canadian Chronic Disease Surveillance System: Mental Illness in Canada* (Public Health Agency of Canada, 2015) emphasizes that administrative health care records may capture incidences where a person does not meet all standard diagnostic criteria for a mental illness, but were assigned a diagnosis code based on clinical assessment by a physician. Conversely, administrative health care records may not capture individuals who meet all standard diagnosis criteria for a mental illness, but have not sought health service use or sought health service use, but were not diagnosed according to a physician (Public Health Agency of Canada, 2015). In addition, the MSI and CIHI databases did not include information on if a participant moved out of province. HDNS does provide a registry with this information, but it was not used in the current study therefore limiting the tracking of participants. However, with the information used for the current study, the MSI and CIHI databases indicated that 79% (n = 3754) of participants had at least one physician contact in 2009, and 39% of participants (n = 1877) had at least one physician contact in 2010.

Nonetheless, the use of administrative health care records to examine the temporal relationship between bullying behaviours and internalizing problems is relatively novel, and the majority of past literature has used self-report or interview methods to measure long-term mental health problems (Kim & Leventhal, 2006;

Sourander et al., 2000; Wolke et al., 2013). Assessing the link between bullying behaviours and long-term mental health outcomes through innovative methodological designs is crucial to further understand how bullying behaviours are affecting children's long-term mental health status. There is strength in having two different informants report the exposure variable (bullying behaviours) versus the outcome variable (number of physician-diagnosed internalizing disorders) in objective 2 as they are based on diverse rather than the same perspectives (Kim et al., 2006). Additionally, the observation period of seven years is longer than past studies (Bond et al., 2001; Kaltiala-Heino et al. 2010). Furthermore, the current study focused on all forms of bullying behaviour (being a victim, being a bully, being a bully-victim), while past literature has primarily focused on the relationship between victimization and poor mental health.

As interest in the long-term effects of bullying behaviours has only begun to advance in the past 15 to 20 years, the current study is one of only a few to examine the temporal relationship between childhood bullying behaviours and long-term internalizing problems. The study's findings offer further insight to unravel the interconnected relationship between bullying behaviours and poor mental health.

Implications of the Findings on Health Promotion Policy and Practice

As research on the link between bullying behaviours and poor mental health is still relatively unexamined, it has yet to receive the scientific attention needed to fully understand the long-term consequences that bullying behaviours may have on individual health (Berger, 2007). Unfortunately, public health interest on the relationship between bullying behaviours and poor mental health predominantly arises when there is a crisis situation, such as a death in schools (Tolan, 2004). The sporadic interest in the topic

strongly impacts the allocation of research funds and the amount of effort that is placed on bullying prevention strategies, policy implementation and program planning (Berger, 2007; Tolan, 2004). Although researchers and health practitioners may understand the general harmful effects linked to bullying behaviours, the lay consensus is that bullying behaviours are of minor harm and a normal part of growing up, rather than a serious form of repeated aggression. Adding to the growing body of literature on the detrimental effects of bullying behaviours is vital in allocating for further effort, funds and resources to be placed on bullying prevention strategies.

The current study shows both new, inconsistent and similar patterns to past research illustrating that the way bullying behaviours are associated with poor mental health are complex and may come in various forms. Nevertheless, there are several implications for health promotion policy and practice that arise from this study that can assist professionals in building effective bullying prevention strategies. The high prevalence of internalizing symptoms and bullying behaviours in school-age children is prominent, and reinforces the notion that childhood distress and bullying behaviours are problematic issues in school environments that have yet be resolved.

Understanding the factors that are associated with bullying behaviours is critical to inform health practitioners, educators and policymakers of the identifiers of bullying behaviour and assists in further modifying prevention strategies. Reijntjes et al. (2010) meta-analysis noted that past studies have neglected to understand the factors that make children more vulnerable to peer victimization. The current study's findings contribute to understanding what factors influence bullying behaviour involvement (internalizing symptoms, peer relationships, childhood obesity) across socio-demographic subsets.

These findings will further inform more targeted and effective prevention and policies strategies. The study's results also suggest that bullying prevention strategies need to focus on understanding all forms of bullying behaviours (being a victim, being a bully, being a bully-victim) as children who have high internalizing symptoms are more likely to be victims, as well as perpetrators of bullying compared to their non-involved peers. Furthermore, providing longitudinal data on the detrimental effects of childhood bullying behaviours on long-term mental health problems further reinforces the need for early prevention strategies to reduce the prevalence of mental health problems in the population.

Consistent with the research conducted, the majority of research on bullying behaviours takes place in a school-based setting (Allison et al., 2009; Annerbäck et al., 2014; Baldry, 2004; Bogart et al., 2014, Fekkes et al., 2006; Kaltiala-Heino et al., 2000) and therefore bullying prevention strategies should primarily focus on changing behaviours in the school-environment. As the study indicates that the link between bullying behaviours and long-term internalizing problems is apparent across gender and socio-demographic factors, schools are an ideal setting to provide bullying prevention programs to large groups of diverse children. Due to the rising concern for children's health, schools across Nova Scotia and Canada are adopting a health promotion approach to comprehensively understand and support the health of children (McIsaac, Sim, Penney, & Kirk, 2012). Such an approach can help to change the environmental setting to which the bullying behaviours are occurring. Marmot, Friel, Bell Houweling and Taylor (2008) highlighted that real-world change can only occur if we shift responsibility away from the health sector and place emphasis on targeting the issues that most strongly impact the

social determinants of health, such as the school climate. As supported by the study, internalizing symptoms and all forms of bullying behaviours are inter-related and there is value in focusing efforts on a holistic approach to health to assist in reducing all factors that are associated with bullying behaviours. The school climate can dramatically impact the prevalence of bullying behaviours and contributes to the overall mental health and well-being of children (Hodgins, 2008).

Although it is important for health practitioners, as well as school staff to understand the symptoms and identifiers of depression, anxiety, and low self-esteem that make children more vulnerable to bullying behaviours (Craig et al., 2010). Green, Poland, and Rootman (2000) emphasize that it is vital for individuals not to be treated in isolation from their social systems in which they operate. Espelage et al. (2014) advised that classroom activities, teacher engagement and the broader school environment are major factors that contribute to hindering or promoting bullying behaviours across school communities. Understanding the factors and consequences of bullying behaviours will help schools further specify what strategies are needed to create a positive school climate that reduce bullying behaviours and distress in children. A positive school climate can reduce bullying behaviour involvement through the promotion of healthy relationships, safe environments and youth development (Craig et al., 2010; Espelage et al., 2014; Hodgins, 2008).

Work to reduce aggression and violence in schools through prevention and intervention strategies is not novel**.** However, the inconsistency in implementation strategies and lack of monitoring make it difficult to know what bullying prevention strategies are being correctly utilized (Smith, Schneider, Smith, & Ananiadou, 2004).

With the high prevalence of mental health problems in Canada (Canadian Mental Health Association, n.d., Public Health Agency of Canada, 2015), research understanding the link between bullying behaviours and poor mental health may assist in creating more rigorous implementation and evaluation strategies to reduce bullying behaviours in school-environments.

Research shows that the most effective bullying prevention strategies take a multi-level method, such as a whole-school or community-based approach, rather than focusing on one specific intervention tactic (Espelage et al., 2014). A whole-school approach takes a health promotion perspective to bullying behaviours and embeds bullying prevention within the curriculum and wider school activities and initiatives (Holt et al., 2013). A community-based approach takes a wider approach to reducing bullying behaviours by addressing and acknowledging factors outside the sphere of educators' capacity (Holt et al., 2013). Effort to create a socio-ecological approach for the reduction of bullying behaviours through community involvement is complex, yet work to understand how the interconnection between individual, school, communities and wider social systems promotes or hinders bullying behaviours is needed for operative change and sustainability.

Bullying prevention strategies that take a stand-alone approach, such as teaching guidelines, are programs that primarily focus on a specific tactic, yet the variation in motivation and skills to implement these programs can critically impact the accuracy and effectiveness of the programs (Durlak & DuPre, 2008). Even though specific bullying prevention tactics can be successful, having a positive school climate is vital to reducing aggression and lays a necessary foundation for any stand-alone bullying prevention

efforts (Low & Van Ryzin, 2014).

Locally, in Nova Scotia the *Speak Up: An Action Plan to Address Bullying and Cyber Bullying Behaviour* (Province of Nova Scotia, 2013) outlines future plans for updated strategies, policies and initiatives to reduce bullying behaviours by taking a restorative approach to bullying behaviours that incorporates similar strategies to a school-wide and community-based approach. Work to reduce bullying behaviour in the school-environment is also outlined in the *Promoting Respectful and Responsible Relationships Act* established in 1995/96 (Office of the Legislative Counsel, Nova Scotia House of Assembly, & 2012 Crown in right of Nova Scotia, 2012) and the *Provincial School Code of Conduct Policy* (Government of Nova Scotia, n.d.). However, the majority of information and resources on bullying behaviours focus on the reduction of violence and promotion of safety, and there is a dearth of information emphasizing the detrimental effects bullying behaviours can have on individual's health. Hawker and Boulton (2000) highlighted that providing evidence-based research on the strong association between bullying behaviours and poor mental health is fundamental in gaining the interest of health professionals and policymakers to take action in focusing efforts on effective strategies and initiatives to reduce bullying behaviours and distress in children. As Nova Scotia has one of the highest rates of mental health service use for mental health illness in Canada (Public Health Agency of Canada, 2015), this study reinforces the need to recognize bullying as an early risk for mental health problems to inform effective policies and practice.

Future Research

This study highlights that bullying behaviours represents a public health concern due to its high prevalence in school environments and direct connection to internalizing problems. The cross-sectional association between victimization and poor mental health is already apparent from the review of the literature. Further health research on bullying behaviours needs to focus on an array of research objectives, including the psychological make-up of victims, bullies and bully-victims. Comprehensively understanding the characteristics for each sub-group is critical to insure research is assisting in harnessing successful prevention strategies that target all sub-groups of bullying behaviour. Furthermore, there is strength in using cross-sectional studies to understand the social and environmental factors that are linked to bullying behaviour involvement to further tailor prevention strategies (Arseneault et al., 2010).

In addition to examining the cross-sectional association between bullying behaviours and poor mental health, the majority of future research should focus on examining the long-term consequences of bullying behaviour involvement. It is essential that longitudinal studies concentrate on systematically understanding the frequency and type of bullying behaviours (being a victim, being a bully, being a bully-victim) that are related to the development of future mental health problems. Consistent with the current study's design, further longitudinal studies that are conducted in a population-based sample, with a long observation period are need to comprehensively understand the long-term relationship and increase generalizability. Furthermore, as surfaced from the current study and past research, children may develop different forms of mental health problems,

such as internalizing versus externalizing problems. Future research should aim to understand the different types of mental health problems that may arise or be reinforced from different forms of bullying behaviour involvement.

Conclusion

The link between childhood bullying behaviours and poor mental health is complex and multi-faceted. The present study used a cross-sectional and prospective cohort design to add knowledge on the factors associated with bullying behaviour involvement, as well as the detrimental effects of bullying behaviours on long-term internalizing problems. More specifically, the study contributed new knowledge on the harmful effects that childhood victimization can have, as defined by the development of a future physician-diagnosed internalizing disorders. From a population health perspective it is critical to understand what social and environmental factors influence the health and well-being of the overall population (Kindig & Stoddart, 2003). Contributing new information on the link between bullying behaviours and poor mental health is vital in identifying bullying behaviours as an early risk factor for long-term mental health problems. The current study provides new evidence for the importance of implementing early prevention strategies to reduce bullying behaviours in children. Furthermore, the study assist to inform effective policies and prevention strategies to reduce the prevalence of childhood bullying behaviours and mental health problems in the overall population.

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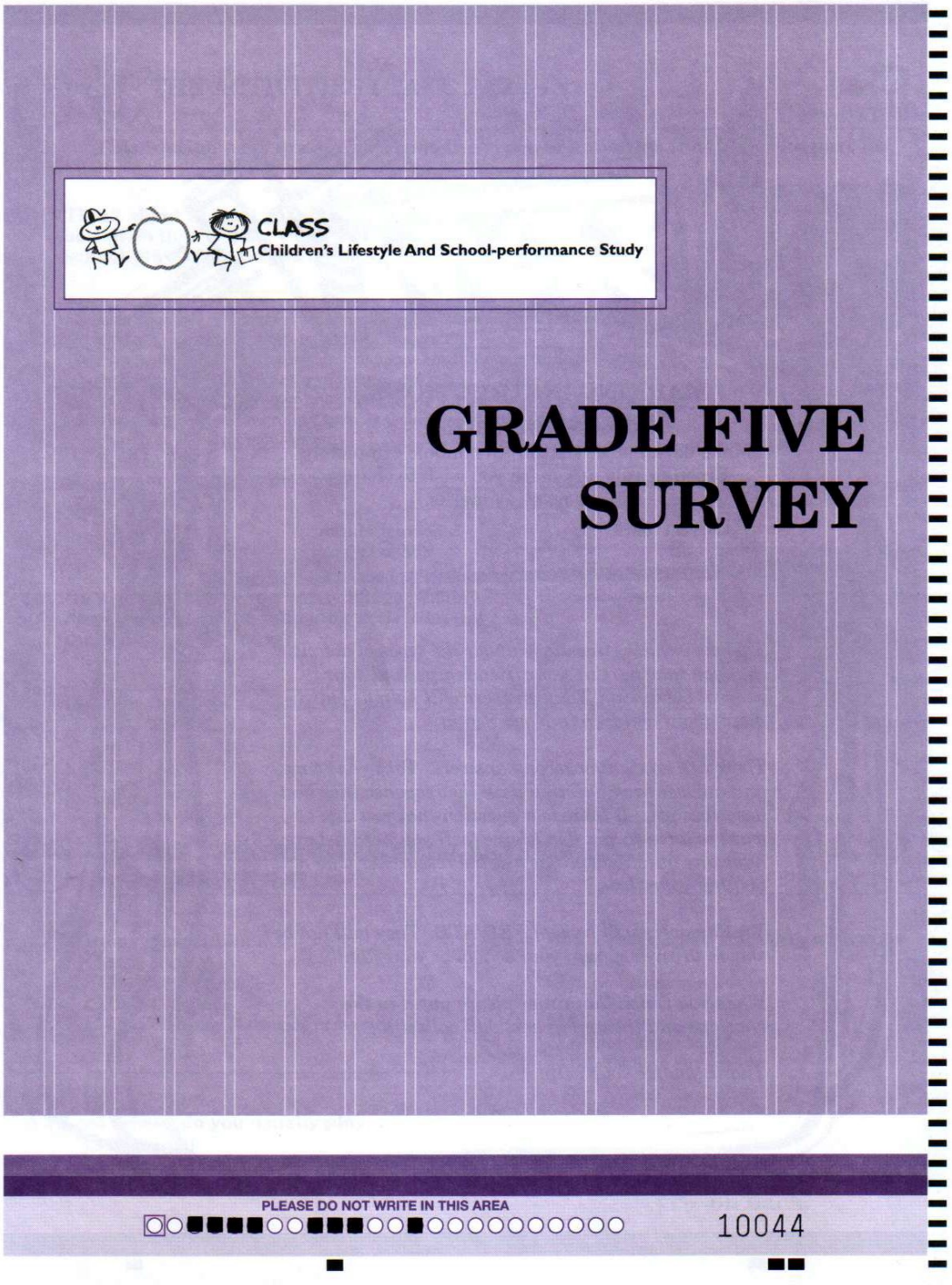
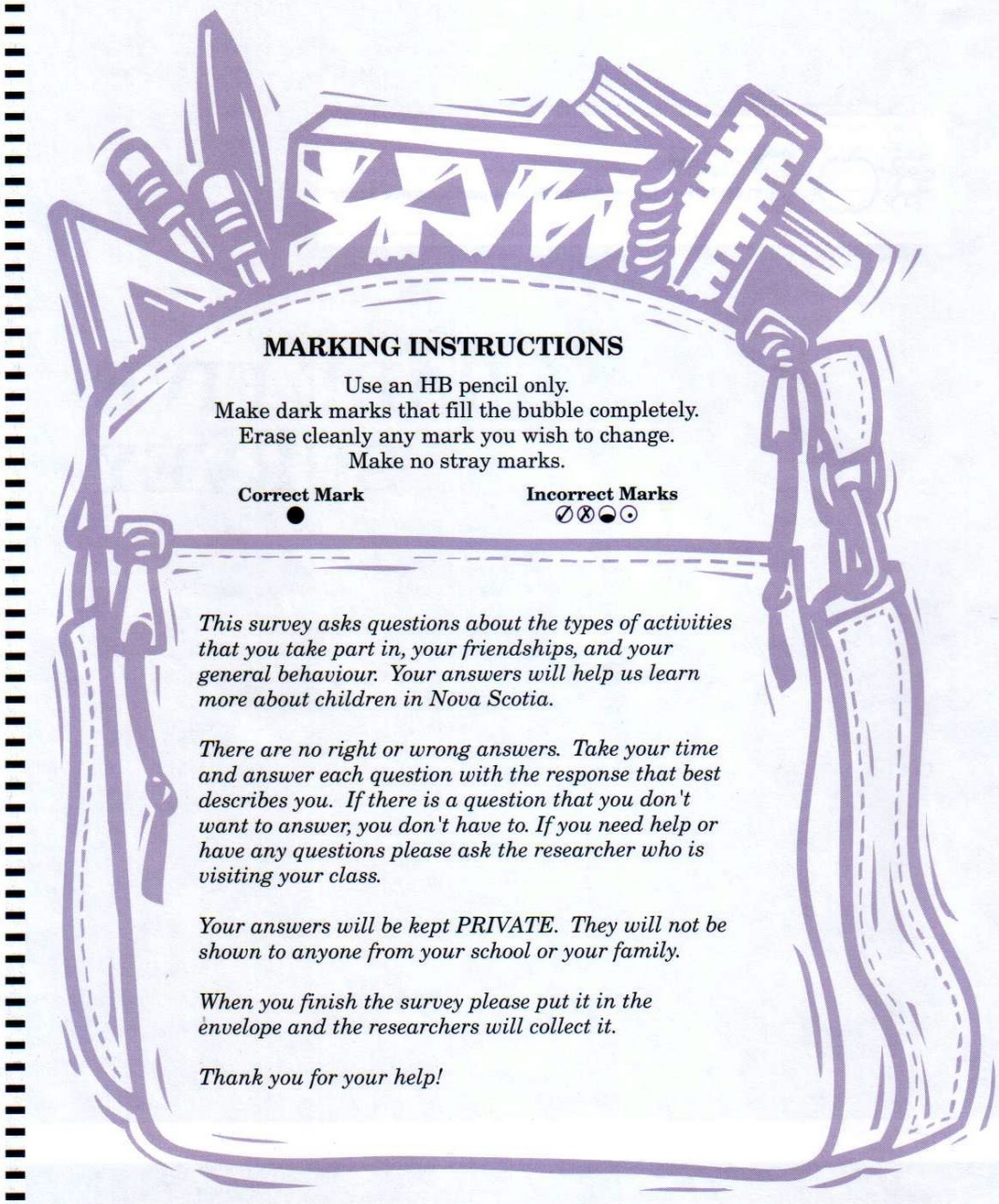
Appendix A: 2003 Children's Lifestyle and School Performance Student Survey





MARKING INSTRUCTIONS

Use an HB pencil only.
Make dark marks that fill the bubble completely.
Erase cleanly any mark you wish to change.
Make no stray marks.

Correct Mark ●

Incorrect Marks ⊘ ⊗ ◒ ⊙

This survey asks questions about the types of activities that you take part in, your friendships, and your general behaviour. Your answers will help us learn more about children in Nova Scotia.

There are no right or wrong answers. Take your time and answer each question with the response that best describes you. If there is a question that you don't want to answer, you don't have to. If you need help or have any questions please ask the researcher who is visiting your class.

Your answers will be kept PRIVATE. They will not be shown to anyone from your school or your family.

When you finish the survey please put it in the envelope and the researchers will collect it.

Thank you for your help!

SECTION 1 THE ACTIVITIES I TAKE PART IN

This section asks questions about the types of activities that you take part in.

1-1. Think about the last year. Think about the activities that you do, when you are not at school. How often do you usually...

	Never	Less than once a week	1 to 3 times a week	4 or more times a week
a. Play sports or do physical activity WITHOUT a coach or instructor (such as riding a bike, skateboarding, rollerblading, etc.)?	○	○	○	○
b. Play sports WITH a coach or instructor, other than in gym class (soccer, swimming lessons, hockey, gymnastics, etc.)?	○	○	○	○
c. Take part in art, drama or music groups, or lessons outside of school hours?	○	○	○	○
d. Take part in clubs or groups, such as Guides or Scouts, 4H club, community, church or other religious groups?	○	○	○	○
e. Read for fun?	○	○	○	○
f. Use a computer or play video games?	○	○	○	○
g. Watch TV?	○	○	○	○

1-2. On average, about how many hours per day do you spend on the following activities, not including school hours?

	Less than 1 hour a day	1-2 hours a day	3-4 hours a day	5-6 hours a day	7 or more hours a day
a. Using a computer or playing video games	○	○	○	○	○
b. Watching TV	○	○	○	○	○

SECTION 2 MY FRIENDSHIPS, SELF-ESTEEM, AND BEHAVIOUR

2-1. In my class, I like...

- ○ Most of the kids
- ○ Some of the kids
- ○ Only 1 or 2 kids
- ○ I don't like any of the kids in my class

2-2. At recess, do you usually play...

- ○ By yourself
- ○ With one other friend
- ○ With more than one other friend

2-3. How often do you get along with your friends?

- ○ Never or almost never
- ○ Sometimes
- ○ Frequently
- ○ Almost always or always
- ○ I do not have any friends

Please continue on back.

2-4. Please read the following statements and choose the answer that best describes you.

	Never or almost never	Sometimes	Often or almost always
a. I feel like I do not have any friends.	○	○	○
b. My future looks good to me.	○	○	○
c. I like the way I look.	○	○	○
d. I like myself.	○	○	○
e. I feel unhappy or sad.	○	○	○
f. I worry a lot.	○	○	○
g. I cry a lot.	○	○	○
h. I get into physical fights.	○	○	○
i. I am bullied by other kids.	○	○	○
j. I bully other kids.	○	○	○
k. I have trouble paying attention.	○	○	○

THE FOODS I EAT

3-1. This section asks about the foods you eat. For the next four foods please look at the examples that the researcher will show you. Please tell us which one looks most like the size you usually eat or please tell us if the size you usually eat is smaller or larger than the examples.

	Smaller than example #1	Example #1	Example #2	Example #3	Larger than example #3	I don't eat this food
a. French fries	○	○	○	○	○	○
b. Meat, fish, chicken	○	○	○	○	○	○
c. Cooked vegetables	○	○	○	○	○	○
d. Chips (potato chips/corn chips/Doritos)	○	○	○	○	○	○

Thank you for taking part in this survey!

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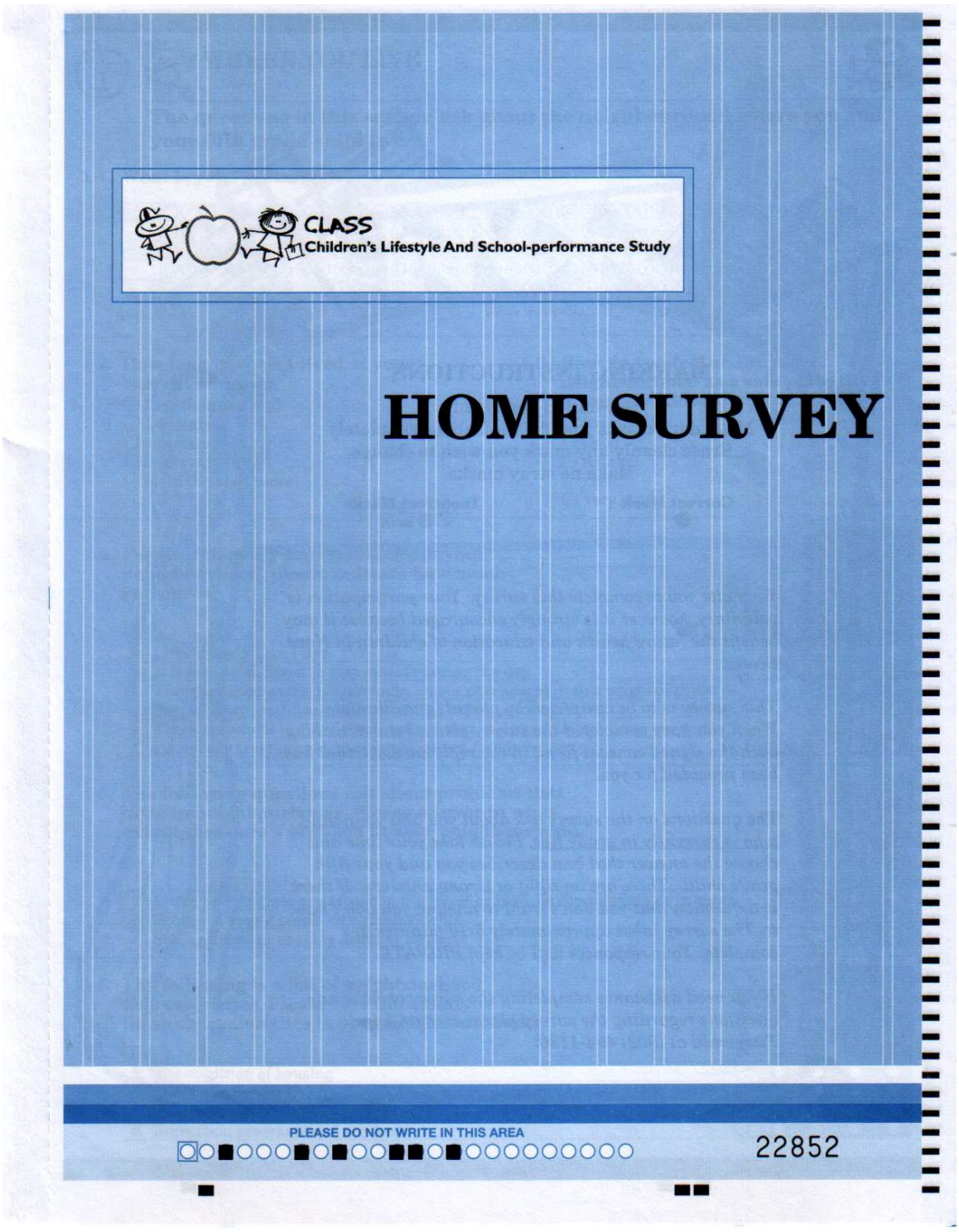
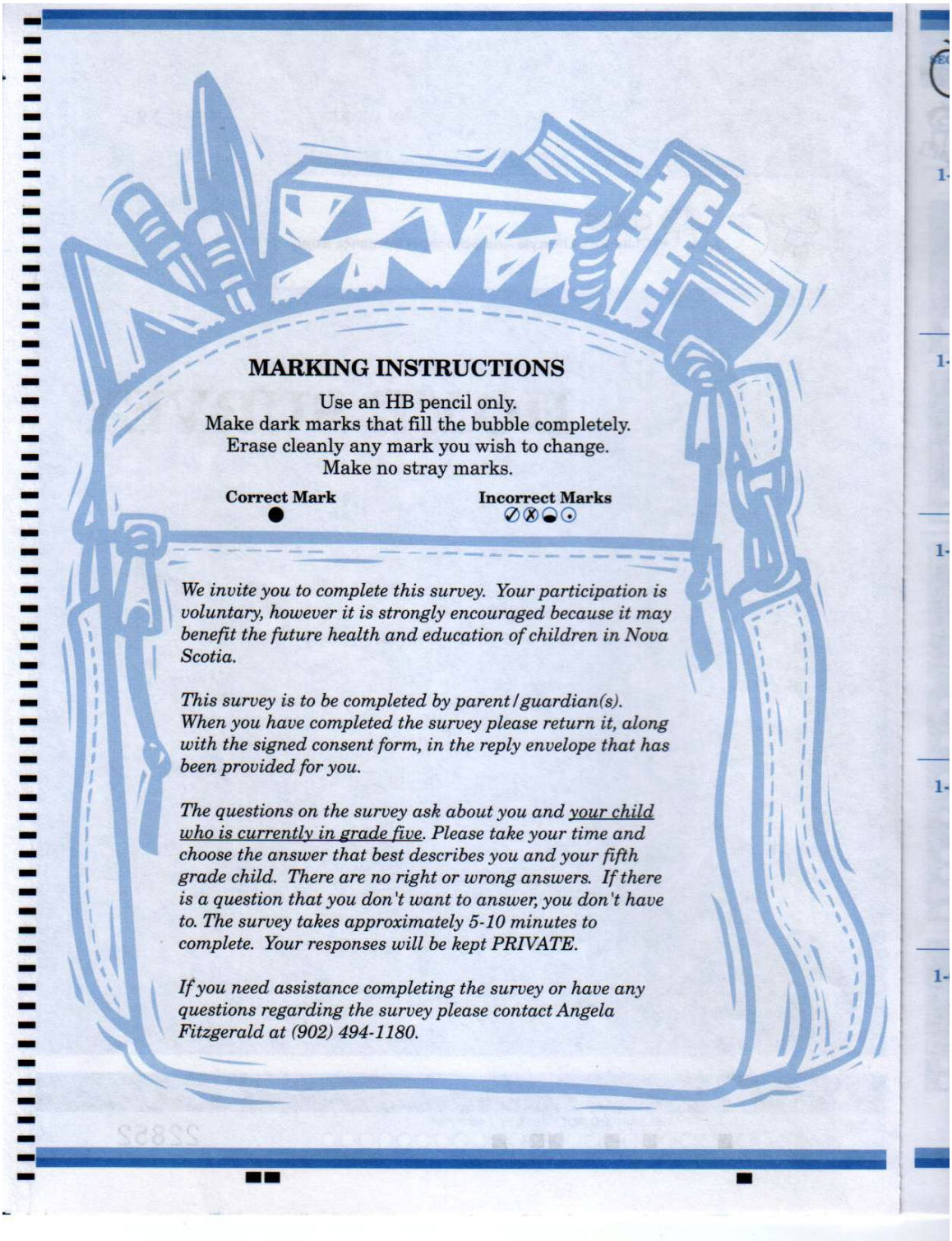
Appendix B: 2003 Children's Lifestyle and School Performance Home Survey





MARKING INSTRUCTIONS

Use an HB pencil only.
Make dark marks that fill the bubble completely.
Erase cleanly any mark you wish to change.
Make no stray marks.

Correct Mark ●

Incorrect Marks ⊘ ⊗ ◒ ⊙

We invite you to complete this survey. Your participation is voluntary, however it is strongly encouraged because it may benefit the future health and education of children in Nova Scotia.

This survey is to be completed by parent/guardian(s). When you have completed the survey please return it, along with the signed consent form, in the reply envelope that has been provided for you.

The questions on the survey ask about you and your child who is currently in grade five. Please take your time and choose the answer that best describes you and your fifth grade child. There are no right or wrong answers. If there is a question that you don't want to answer, you don't have to. The survey takes approximately 5-10 minutes to complete. Your responses will be kept PRIVATE.

If you need assistance completing the survey or have any questions regarding the survey please contact Angela Fitzgerald at (902) 494-1180.

SECTION 1

WHERE YOU LIVE

The questions in this section ask about the neighbourhood where you and your fifth grade child live.

1-1. What is your postal code?

	○ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ Ⓘ Ⓙ Ⓚ Ⓛ Ⓜ Ⓝ Ⓞ Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ Ⓤ Ⓥ Ⓦ Ⓧ Ⓨ Ⓩ ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
	○ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ Ⓘ Ⓙ Ⓚ Ⓛ Ⓜ Ⓝ Ⓞ Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ Ⓤ Ⓥ Ⓦ Ⓧ Ⓨ Ⓩ ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
	○ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ Ⓘ Ⓙ Ⓚ Ⓛ Ⓜ Ⓝ Ⓞ Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ Ⓤ Ⓥ Ⓦ Ⓧ Ⓨ Ⓩ ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
	○ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ Ⓘ Ⓙ Ⓚ Ⓛ Ⓜ Ⓝ Ⓞ Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ Ⓤ Ⓥ Ⓦ Ⓧ Ⓨ Ⓩ ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
	○ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ Ⓘ Ⓙ Ⓚ Ⓛ Ⓜ Ⓝ Ⓞ Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ Ⓤ Ⓥ Ⓦ Ⓧ Ⓨ Ⓩ ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
	○ Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ Ⓕ Ⓖ Ⓗ Ⓘ Ⓙ Ⓚ Ⓛ Ⓜ Ⓝ Ⓞ Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ Ⓤ Ⓥ Ⓦ Ⓧ Ⓨ Ⓩ ⓪ ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

1-2. How long have you lived at your current address?

- ○ Less than one year
- ○ 1-3 years
- ○ 4-5 years
- ○ 6-10 years
- ○ More than ten years

1-3. How do you feel about your neighbourhood as a safe place to bring up children?

- ○ Excellent
- ○ Good
- ○ Average
- ○ Poor
- ○ Very poor

1-4. For the following statements about your neighbourhood, please indicate how much you agree.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. I like living where I live.	○	○	○	○	○
b. It is safe for children to play outside during the day.	○	○	○	○	○
c. There are good parks, playgrounds, and/or play spaces in this neighbourhood.	○	○	○	○	○
d. People in my neighbourhood are willing to help each other out.	○	○	○	○	○
e. There are adults in this neighbourhood that children can look up to (respect).	○	○	○	○	○
f. I generally trust my neighbours to look out for my property.	○	○	○	○	○

1-5. The following questions ask about problems that arise in neighbourhoods. Please answer to what extent these are a problem in your neighbourhood.

	A big problem	Somewhat of a problem	No problem
a. Litter, broken glass or garbage in the street or road, on the sidewalk or in yards.	○	○	○
b. Groups of young people who cause trouble.	○	○	○
c. Selling drugs, or abusing drugs or alcohol.	○	○	○

1-6. The following is a list of neighbourhood characteristics. Please rate the quality of these characteristics in your neighbourhood.

	Excellent	Very good	Good	Fair	Poor
a. The condition of housing	○	○	○	○	○
b. Shops and services	○	○	○	○	○
c. Health services	○	○	○	○	○
d. Recreation programs and services	○	○	○	○	○

PLEASE DO NOT MARK IN THIS AREA

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SECTION 2

YOUR FIFTH GRADE CHILD'S ACTIVITIES

2-1. Please indicate how your fifth grade child usually travels to and from school.

	School bus	City bus	Walks/bikes	Is driven	Other
a. **To** school	○	○	○	○	○
b. **From** school	○	○	○	○	○

2-2. Please indicate how long it usually takes your fifth grade child to get to and from school.

	15 minutes or less	16 to 30 minutes	31 to 45 minutes	46 to 60 minutes	More than 60 minutes
a. **To** school	○	○	○	○	○
b. **From** school	○	○	○	○	○

2-3. Think about the past year (12 months). Please indicate how often your fifth grade child usually does the following activities, outside of school hours.

	Never or almost never	About once a month	About once a week	Most days or a few times a week
a. Play sports or do physical activity WITHOUT a coach or instructor (such as riding a bike, skateboarding, rollerblading, etc.)?	○	○	○	○
b. Play sports WITH a coach or instructor, other than in gym class (soccer, swimming lessons, hockey, gymnastics, etc.)?	○	○	○	○
c. Take part in art, drama or music groups, or lessons outside of school hours?	○	○	○	○
d. Activities such as music, arts and crafts, board games, or card collecting at home?	○	○	○	○
e. Take part in clubs or groups, such as Guides or Scouts, 4H club, community, church or other religious groups?	○	○	○	○
f. Read for fun?	○	○	○	○
g. Use a computer or play video games?	○	○	○	○
h. Watch TV?	○	○	○	○

2-4. On average, about how many hours per day does your fifth grade child spend on the following activities, outside of school hours?

	Less than 1 hour a day	1-2 hours a day	3-4 hours a day	5-6 hours a day	7 or more hours a day
a. Using a computer or playing video games	○	○	○	○	○
b. Watching TV	○	○	○	○	○

SECTION 4 YOUR FIFTH GRADE CHILD'S FRIENDSHIPS AND BEHAVIOUR

4-1. How well does your fifth grade child get along with other children his or her age, not including brothers or sisters?

- ○ Very well, no problems
- ○ Quite well, hardly any problems
- ○ Pretty well, occasional problems
- ○ Not too well, frequent problems
- ○ Not well at all, constant problems

4-2. Does your fifth grade child have a close friend or friends with whom he or she plays regularly?

- ○ Yes, many close friends
- ○ Yes, a few close friends
- ○ Yes, 1 close friend
- ○ Not at the moment
- ○ My child has not had any close friends in the past few years

4-3. Would you describe your fifth grade child as being sad or unhappy...

- ○ Never or almost never
- ○ Rarely
- ○ Sometimes
- ○ Frequently
- ○ Almost always or always

4-4. With regard to how your fifth-grade child feels about school, how often does he or she look forward to going to school?

- ○ Almost always or always
- ○ Frequently
- ○ Sometimes
- ○ Rarely
- ○ Never or almost never

4-5. (a) Has your fifth grade child experienced an event or situation in the past year that has caused him or her a great amount of worry or unhappiness?

- ○ Yes
- ○ No
- ○ Don't know

(b) If you answered Yes to the above question, what was the event or situation?

- ○ Move
- ○ Divorce or separation of parents
- ○ Illness or injury of fifth grade child
- ○ Illness or death of a loved one
- ○ Other _____

SECTION 5 YOUR HOUSEHOLD

5-1. Are you...

- ○ Male
- ○ Female

5-2. Were you born in Canada?

- ○ Yes
- ○ No

5-3. In general how would you rate your health?

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

5-4. In general how would you describe your eating habits?

- ○ Very healthy
- ○ Healthy
- ○ Somewhat healthy
- ○ Unhealthy
- ○ Very unhealthy

5-5. In general how would you describe your physical activity level?

- ○ Very high
- ○ High
- ○ Moderate
- ○ Low
- ○ Very low

5-6. What is your relationship to your fifth grade child?

- ○ Birth parent
- ○ Adoptive parent
- ○ Step parent (including common-law parent)
- ○ Foster parent
- ○ Legal guardian
- ○ Other _____

5-7. What is your current marital status?

- ○ Married
- ○ Living Common-Law
- ○ Separated
- ○ Divorced
- ○ Widowed
- ○ Single/Never married
- ○ Prefer not to answer

5-8. Do you share custody of your fifth grade child?

- ○ Yes
- ○ No

5-9. If you share custody of your fifth grade child, how much time does he/she spend in your household?

- ○ Almost all or all of the time
- ○ More than half of the time
- ○ Half of the time
- ○ Less than half of the time
- ○ Almost none or none of the time

5-10. Does your fifth grade child have any brothers or sisters?

- ○ Yes
- ○ No

5-11. Not including yourself and your fifth grade child, how many other people live in your household?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ more than 5

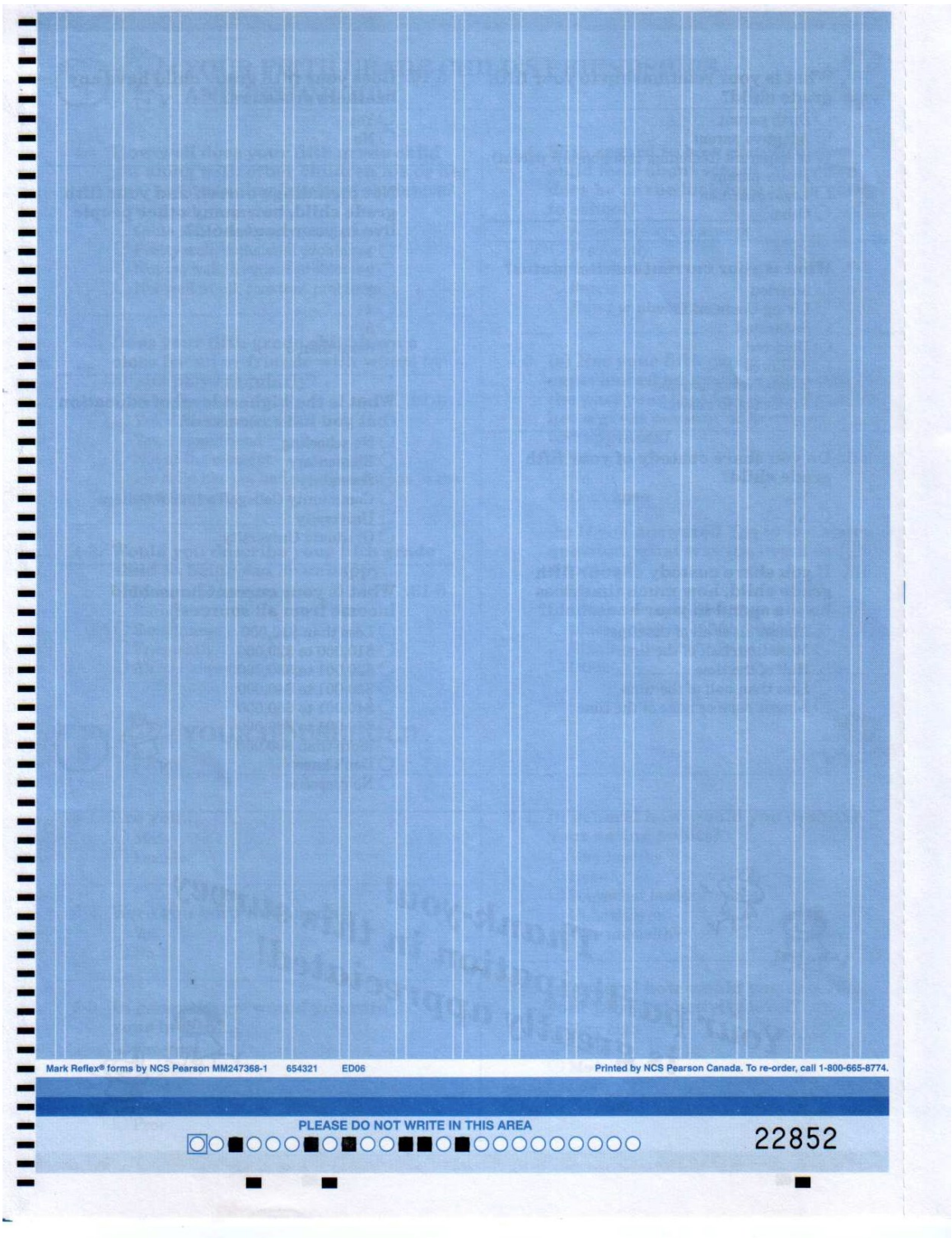
5-12. What is the highest level of education that you have received?

- ○ No schooling
- ○ Elementary
- ○ Secondary
- ○ Community College/Technical College
- ○ University
- ○ Graduate University

5-13. What is your current household income from all sources?

- ○ Less than $10,000
- ○ $10,000 to $20,000
- ○ $20,001 to $30,000
- ○ $30,001 to $40,000
- ○ $40,001 to $50,000
- ○ $50,001 to $60,000
- ○ More than $60,000
- ○ Don't know
- ○ No response

Thank-you! Your participation in this survey is greatly appreciated!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Appendix C: University of Alberta Research Ethics Office: Notification of Approval – Amendment

UNIVERSITY OF ALBERTA

RESEARCH ETHICS OFFICE

308 Campus Tower
Edmonton, AB, Canada T6G 1K8
Tel: 780.492.0459
Fax: 780.492.9429
www.reo.ualberta.ca

Notification of Approval - Amendment

Date:	July 7, 2015
Amendment ID:	Pro00049918_AME7
Principal Investigator:	Paulus Veugelers
Study ID:	Pro00049918
Study Title:	CRIO 2.1: Influence of health behaviors and weight status on mental health and healthcare utilization among children
Sponsor/Funding Agency:	Alberta Innovates Health Solutions AIHS Canada

	Project ID	Project Title	Speed Code	Other Information
RSO-Managed Funding:	RES0021501	Return on investments in innovative interventions that promote healthy eating and active living among children		
	RES0019561	SPH CRC funding allowance		

Approval Expiry Date:	Saturday, June 04, 2016

Thank you for submitting an amendment request to the Research Ethics Board 2. This amendment to conduct additional analysis to examine the association between bullying behaviors and mental health has been reviewed and approved on behalf of the committee.

Sincerely,

Stanley Varnhagen, PhD
Chair, Research Ethics Board 2

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix D: Dalhousie Health Sciences Research Ethics Board Amendment Approval

---------- Forwarded message ----------
From: <sharon.gomes@dal.ca>
Date: Fri, Jul 31, 2015 at 12:29 PM
Subject: REB # 2014-3456 Amendment Approval
To: "Dr Sara Kirk (Primary Investigator)" <sr497188@dal.ca>
Cc: "Dr Paul Veugelers (Co-Investigator)" <PVEUGELE@dal.ca>, sharon.gomes@dal.ca

Health Sciences Research Ethics Board
Amendment Approval

July 31, 2015

Dr Sara Kirk
Health Professions\School of Health Administration

Dear Sara,

REB #: 2014-3456
Project Title: CRIO 2.1: Influence of Health Behaviors and Weight Status on Mental Health and Healthcare Utilization Among Children

The Health Sciences Research Ethics Board has reviewed your amendment request dated July 17,2015 and has approved this amendment request effective today, July 31, 2015.

Sincerely,

Dr. Brenda Beagan, Chair

Appendix F: Health Data Nova Scotia Confidentiality Agreement & Disclaimer

THIS AGREEMENT CREATES IMPORTANT OBLIGATIONS WHICH ARE BINDING

PLEASE READ IN FULL. SIGN, WITNESS AND RETURN ORIGINAL COPY OF PAGE 5

NAME:_____

CONFIDENTIALITY AGREEMENT

This Agreement describes the obligations and responsibilities of confidentiality of the researcher in connection with his/her association with Health Data Nova Scotia, which is part of the Department of Community Health and Epidemiology within the Faculty of Medicine, Dalhousie University ("HDNS").

WHEREAS:

A. Recipient recognizes:

(a) That HDNS, which is part of the Department of Community Health and Epidemiology within the Faculty of Medicine at Dalhousie University, is engaged in work involving research and policy development, utilizing data obtained from the Nova Scotia Department of Health and Wellness ("DHW").

(b) That during his/her period of association with HDNS, he/she may have access or be exposed to and have an opportunity to learn about confidential and personal information of third parties to whom the University and/or DHW owes a duty of confidentiality.

(c) That HDNS has established a Guide to Using our Services to govern the security, use and disclosure of information contained on HDNS databases.

B. The Recipient acknowledges and agrees that execution of a confidentiality agreement substantially similar to this Agreement was one of the terms of association upon the Recipient commencing association with HDNS.

THEREFORE in consideration of the Recipient's period of association with HDNS, and other good and valuable consideration, the sufficiency of which is acknowledged, the Recipient agrees as follows:

ARTICLE 1 – DEFINITIONS

1.1 "Confidential Information" means technical data and other information including but not limited to products, device, mechanisms, substances, organisms, technology, research results or plans, formulas, patterns, compilations, programs, methods, technique processes, know-how, reports, descriptions, drawings compositions, strategies, trade secrets, business and financial information, computer software, and Personal Information that

(a) is subject to HDNS's Data Access Guidelines and Procedures;

(b) is provided to the Recipient as a result of or in connection with the Recipient's association with HDNS;

(c) is the subject of agreements under which Dalhousie University owes a third party a duty of confidentiality and it is identified as such to the Recipient; or

(d) is, or may be developed from the results of work done under research contracts or other research funding arrangements between Dalhousie University and third parties and is identified as such to the Recipient.

but excludes information which:

(a) is or becomes part of the public domain other than by a breach of confidentiality obligations to the University or privacy laws; or

(b) is lawfully obtained from third parties other than pursuant to 1.1 (c) or 1.1(d).

1.2 "Personal Information" means any information about an identifiable individual including but not limited to name, age, personal characteristics, contact information, health information, employment information, and financial information.

1.3 "Recipient" has the meaning ascribed thereto on Page 1.

ARTICLE 2 – CONFIDENTIAL INFORMATION

2.1 Recipient acknowledges that the Confidential Information is a special, valuable, and unique asset which either belongs to or has been entrusted to HDNS. The Recipient agrees:

(a) to maintain all Confidential Information in trust and confidence, taking all reasonable precautions to protect the Confidential Information;

(b) to comply with HDNS's Guide to Using our Services, as amended from time to time, and with all other University regulations, policies, procedures and guidelines and any applicable legislation relating to the protection of confidential or Personal Information; and

(c) not to directly or indirectly use or disclose the Confidential Information to any other person except in the course of performing clearly authorized duties as a Recipient or with HDNS's prior written consent.

(d) <u>Individual level data may not be copied or exported in any format from the secure HDNS Georg3 and Steve systems.</u>

2.2 Recipient agrees not to use, disclose to HDNS, or induce HDNS to use, any trade secret, confidential information or documents belonging to others during his/her period of association. The Recipient represents and warrants that his/her research period will not require him/her to violate any obligation to or confidence of another.

ARTICLE 3 – RETURN OF MATERIALS AT TERMINATION

3.1 Upon completion of the Recipient's association with HDNS, Recipient will promptly deliver to HDNS all tangible Confidential Information and copies

thereof in his/her possession and shall destroy all Confidential Information in non-deliverable form, including, without limitation, the deletion of all documentation, information or data from his/her computer or other electronic systems, and shall provide written confirmation of such destruction to HDNS within the confines of any Ethical Approvals to carry out said research.

ARTICLE 4 – MISCELLANEOUS

4.1 If any provision of this Agreement is wholly or partially unenforceable for any reason, such unenforceability shall not affect the enforceability of the balance of this Agreement, and all provisions of this Agreement shall, if alternative interpretations are applicable, be construed as to preserve the enforceability hereof.

4.2 This Agreement shall be binding upon Recipient whether or not his/her period of association was terminated for any reason and whether or not validly or for cause.

4.3 Article 2 hereof shall survive termination of this Agreement and the termination of the Recipient's association with HDNS for any reason and whether or not validly or for cause.

4.4 No license or transfer of ownership in the Confidential Information,, express or implied, is granted to the Recipient other than to use the Confidential Information in the manner and to the extent authorized by this Agreement.

4.5 Neither this Agreement nor any interest herein may be assigned in whole or in part by the Recipient hereto without the prior written consent of Dalhousie University.

4.6 This Agreement is effective as of the date the Recipient commences his/her period of association with HDNS as evidenced by the date appearing on the first page of this Agreement.

4.7 Recipient acknowledges that he/she has had time to review this Agreement. Recipient acknowledges that he/she fully understands its contents and has had the opportunity of obtaining legal advice concerning its interpretation and effect on him/her.

ACKNOWLEDGED AND AGREED TO:

Please complete all fields

Institution	
Street Address	
City	
Phone	
email	

Researcher Name	
Signature	
Date	

Witness Name	
Witness Signature	
Date	

Mail signed and witnessed ORIGINAL to:
Sandra Pauls
Dalhousie University
5790 University Avenue, Room 113
Halifax, NS
B3H1V7

"*The data (or portions of the data) used in this report were made available by Health Data Nova Scotia of Dalhousie University. Although this research is based on data obtained from the Nova Scotia Department of Health and Wellness, the observations and opinions expressed are those of the authors and do not represent those of either Health Data Nova Scotia or the Department of Health and Wellness*"

Appendix G: List of Appendix G Tables

Table G1

Descriptive statistics for internalizing symptoms survey questions by bullying behaviours, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

Internalizing symptoms survey questions	Population (%)	Victim (%)	Bully (%)	Bully-Victim (%)	Non-Involved (%)
I feel like I don't have any friends					
Never or almost never	70.95	17.95	4.26	3.05	74.74
Sometimes	22.58	41.54	4.43	7.97	46.06
Often or almost always	6.47	35.33	4.96	8.51	51.20
I like myself (+)					
Never or almost never	6.20	23.55	7.34	13.30	55.81
Sometimes	23.79	29.97	6.31	6.42	57.30
Often or almost always	69.53	22.45	3.43	3.09	71.03
Missing	0.49	- - - -	- - - -	- - - -	- - - -
I like the way I look (+)					
Never or almost never	7.24	37.45	5.40	10.06	47.09
Sometimes	39.16	27.60	3.87	5.11	63.42
Often or almost always	53.34	20.24	4.54	3.30	71.92
Missing	0.26	- - - -	- - - -	- - - -	- - - -
My future looks good to me (+)					
Never or almost never	4.51	27.79	6.15	17.75	48.31
Sometimes	35.43	28.78	5.44	5.08	60.70
Often or almost always	59.70	21.59	3.44	3.17	71.80
Missing	0.36	- - - -	- - - -	- - - -	- - - -
I feel unhappy or sad					
Never or almost never	37.71	15.78	4.07	2.28	77.87
Sometimes	56.41	29.19	4.37	5.33	61.11
Often or almost always	5.39	32.32	6.05	10.80	50.83
Missing	0.49	- - - -	- - - -	- - - -	- - - -
I worry a lot					
Never or almost never	49.82	19.62	4.59	2.71	73.08
Sometimes	40.40	28.02	3.98	5.30	62.70
Often or almost always	9.25	33.83	4.84	10.76	50.57
Missing	0.53	- - - -	- - - -	- - - -	- - - -
I cry a lot					
Never or almost never	68.34	21.02	4.73	2.68	71.57
Sometimes	25.85	31.78	2.99	6.98	58.25
Often or almost always	5.13	31.10	6.10	17.20	45.60
Missing	0.68	- - - -	- - - -	- - - -	- - - -
I have trouble paying attention					
Never or almost never	50.77	18.67	2.67	1.98	76.68
Sometimes	42.23	29.20	5.41	5.34	60.05
Often or almost always	7.00	37.08	10.00	17.93	34.99

*Bullying behaviours broken down by row percentages

Table G2

Descriptive statistics for peer relationships survey questions by bullying behaviours, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

Peer relationships survey questions	Population (%)	Victim (%)	Bully (%)	Bully-Victim (%)	Non-Involved (%)
In my class I like…					
Most of the kids	70.48	19.71	3.71	3.44	73.14
Some of the kids	25.69	33.67	6.03	6.43	53.87
Only 1 or 2 kids	3.22	50.96	4.63	9.50	34.91
I don't like any of the kids in my class	0.32	34.08	10.10	25.02	30.80
Missing	0.29	- - - -	- - - -	- - - -	- - - -
At recess do you usually play with…					
With more than one other friend	86.63	22.23	4.26	4.58	68.93
With one other friend	9.74	36.66	6.24	2.90	54.20
By yourself	3.05	43.14	5.54	2.96	48.34
Missing	0.58	- - - -	- - - -	- - - -	- - - -
How often do you get along with friends?					
Almost always or always	74.79	20.84	4.14	3.39	71.63
Frequently	15.65	31.17	4.03	5.71	59.09
Sometimes	7.54	43.16	6.17	10.87	39.80
Never or almost never	1.55	28.05	7.83	7.54	56.58
I do not have any friends	0.47	45.80	6.88	26.02	21.30
How well does your fifth grade child get along with other children his or her age, not including brothers or sisters?					
Very well, no problems	44.07	16.49	3.11	2.88	77.52
Quite well, hardly any problems	32.93	26.94	4.62	4.78	63.66
Pretty well, occasional problems	14.35	39.47	6.72	8.63	45.18
Not too well, frequent problems/Not well at all, constant problems	1.84	61.27	4.14	10.85	23.74
Missing	6.81	- - - -	- - - -	- - - -	- - - -
Does your fifth grade child have a close friend or friends with whom he or she plays regularly?					
Yes, many close friends	29.51	18.20	3.87	4.48	73.45
Yes a few close friends	53.31	25.02	4.68	3.99	66.31
Yes, 1 close friend	6.25	38.67	1.23	8.48	51.62
Not at the moment	2.96	44.89	3.68	6.87	44.56
My child has not had any close friends in the past few years	1.21	44.94	6.88	8.03	40.15
Missing	6.76	- - - -	- - - -	- - - -	- - - -

*Bullying behaviours broken down by row percentages

Table G3

OR and 95% CI of association between internalizing symptoms and bullying behaviours when adjusting for number of primary physician-diagnosed internalizing disorder prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High internalizing symptoms	3.12 (2.66, 3.65)*+	2.65 (1.94, 3.63)*+	10.76 (7.29, 15.87)*+
Missing	2.51 (1.64, 3.84)*+	2.66 (1.24, 5.70)*+	4.97 (1.92, 12.86)*+
Physician-diagnosed internalizing disorder before 2003	1.06 (1.01, 1.12)*+	0.99 (0.88, 1.11)	1.09(0.95, 1.24)

* $p<0.05$

+ Increased probability of outcome variable compared to referent group

Table G4

OR and 95% CI of association between internalizing symptoms and bullying behaviours when adjusting for all confounding variables and excluding children who had a primary physician-diagnosed internalizing disorder prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High internalizing symptoms	3.07 (2.60,3.62)*+	2.72 (1.93, 3.84)*+	12.17 (7.69, 19.28)*+
Missing	2.60 (1.68,4.02)*+	2.30 (0.85, 6.23)	6.76 (2.58,17.74)*+
Gender			
Boys	1.00	1.00	1.00
Girls	0.69 (0.59, 0.81)*–	0.33 (0.23,0.48)*–	0.32 (0.22, 0.47)*–
Parent/guardian education			
Secondary or less	1.00	1.00	1.00
College	1.10 (0.89, 1.35)	0.80 (0.51, 1.26)	0.87 (0.52,1.46)
University	0.93 (0.76, 1.13)	0.58 (0.38, 0.87)*–	0.74 (0.46, 1.16)
Missing	0.64 (0.25, 1.65)	0.67 (0.22, 2.03)	0.22 (0.03, 1.76)
Household income			
20, 000 or less	1.00	1.00	1.00
20, 001 to 60,000	0.67 (0.49, 0.90)*–	0.62 (0.34, 1.11)	0.58 (0.32, 1.05)
More than 60,000	0.52 (0.37, 0.74)*–	0.40 (0.21, 0.76)*–	0.30 (0.16, 0.57)*–
Missing	0.76 (0.54, 1.07)	0.69(0.34, 1.38)	0.69 (0.35, 1.34)
Parent/guardian marital status			
Single/divorced/separated/widowed	1.00	1.00	1.00
Married/common-law	0.98 (0.78, 1.23)	0.76 (0.49, 1.17)	1.42 (0.81, 2.48)
Missing	1.12 (0.40, 3.13)	1.13 (0.39, 3.21)	3.48 (0.43, 27.93)

* $p<0.05$

\+ Increased probability of outcome variable compared to referent group

– Decreased probability of outcome variable compared to referent group

Table G5

OR and 95% CI of association between overweight/obesity and bullying behaviours when adjusting for internalizing symptoms and number of primary physician-diagnosed internalizing disorders a child had prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Body weight			
Normal weight	1.00	1.00	1.00
Overweight/Obese	1.24 (1.05, 1.46)*+	0.80 (0.54, 1.17)	1.05 (0.71, 1.56)
Missing	0.88 (0.69, 1.12)	0.72 (0.44, 1.19)	1.16 (0.70, 1.93)
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High internalizing symptoms	3.06 (2.62, 3.58)*+	2.66 (1.94, 3.63)*+	10.79 (7.29, 15.94)*+
Missing	2.56 (1.67, 3.90)*+	2.69 (1.25, 5.76)*+	4.91 (1.90, 12.69)*+
Physician-diagnosed internalizing disorder before 2003	1.06 (1.01, 1.11)*+	0.99 (0.88, 1.12)	1.09 (0.96, 1.23)

*$p < 0.05$

+ Increased probability of outcome variable compared to referent group

Table G6
OR and 95% CI of association between overweight/obesity and bullying behaviours when adjusting for all confounding variables and excluding children who had a primary physician-diagnosed internalizing disorder prior to 2003, *Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.*

	Being a victim	Being a bully	Being a bully-victim
Body weight			
Normal weight	1.00	1.00	1.00
Overweight/obese	1.18 (0.99, 1.40)	0.80 (0.51,1.26)	0.92 (0.59, 1.44)
Missing	0.86 (0.65, 1.13)	0.78 (0.44, 1.40)	1.21 (0.65, 2.24)
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High Internalizing symptoms	3.01 (2.55, 3.56)*+	2.72 (1.93, 3.84)*+	12.33 (7.77, 19.56)*+
Missing	2.64 (1.71, 4.08)*+	2.28 (0.83,6.21)	6.57 (2.52, 17.15)*+
Gender			
Boys	1.00	1.00	1.00
Girls	0.70 (0.60, 0.81)*–	0.33 (0.23,0.48)*–	0.32 (0.22, 0.47)*–
Parent/guardian education			
Secondary or less	1.00	1.00	1.00
College	1.10 (0.89, 1.36)	0.80 (0.51, 1.26)	0.86 (0.51, 1.46)
University	0.93 (0.77, 1.13)	0.58 (0.38, 0.88)*–	0.73 (0.46, 1.16)
Missing	0.67 (0.26, 1.74)	0.70 (0.22, 2.20)	0.20 (0.02, 1.77)
Household income			
20, 000 or less	1.00	1.00	1.00
20, 001 to 60,000	0.66 (0.49, 0.90)*–	0.62 (0.34, 1.13)	0.58 (0.33,1.06)
More than 60,000	0.53 (0.37, 0.74)*–	0.40 (0.21, 0.76)*–	0.30 (0.16, 0.58)*–
Missing	0.76 (0.54, 1.07)	0.69 (0.34, 1.40)	0.69 (0.35, 1.35)
Parent/guardian marital status			
Single/divorced/separated/widowed	1.00	1.00	1.00
Married/common-law	0.97 (0.77, 1.22)	0.74 (0.48, 1.16)	1.43 (0.82, 2.49)
Missing	1.13 (0.41, 3.15)	1.11 (0.38, 3.22)	3.55 (0.42, 29.81)

*p <0.05
+ Increased probability of outcome variable compared to referent group
– Decreased probability of outcome variable compared to referent group

Table G7

OR and 95% CI of association between peer relationships and bullying behaviours when adjusting for internalizing symptoms and number of primary physician-diagnosed internalizing disorders a child had prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Peer relationships			
Good peer relationships	1.00	1.00	1.00
Poor peer relationships	2.86 (2.45, 3.33)*+	1.85 (1.31, 2.60)*+	2.08 (1.49, 2.91)*+
Missing	1.40 (1.05, 1.87)*+	1.74 (1.02, 2.77)*+	0.98 (0.48, 2.013)
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High internalizing symptoms	2.51 (2.14, 2.95)*+	2.35 (1.69, 3.26)*+	9.12 (5.98,13.91)*+
Missing	2.27 (1.48, 3.48)*+	2.46 (0.87, 1.13)	4.67 (1.83,11.92)*+
Physician-diagnosed internalizing disorder before 2003	1.04 (1.01, 1.08)*+	0.99 (0.87, 1.13)	1.08 (0.96,1.23)

* $p < 0.05$

+ Increased probability of outcome variable compared to referent group

Table G8

OR and 95% CI of association between peer relationships and bullying behaviours when adjusting for all confounding variables and excluding children who had a primary physician -diagnosed internalizing disorder prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	Being a victim	Being a bully	Being a bully-victim
Peer relationships			
Good peer relationships	1.00	1.00	1.00
Poor peer relationships	2.77 (2.33, 3.30)*+	1.55 (1.06, 2.30)*+	1.72 (1.18, 2.50)*+
Missing	1.76 (0.86,3.61)	0.98 (0.26,3.69)	1.11 (0.27, 4.63)
Internalizing symptoms			
Low internalizing symptoms	1.00	1.00	1.00
High Internalizing symptoms	2.53 (2.14, 2.99)*+	2.53 (1.83, 3.69)*+	10.86 (7.44, 18.96)*+
Missing	2.33 (1.50, 3.65)*+	2.14 (0.79, 5.86)	6.36 (2.45, 16.47)*+
Gender			
Boys	1.00	1.00	1.00
Girls	0.74 (0.63, 0.87)*-	0.34 (0.23, 0.49)*–	0.32 (0.22, 0 .48)*–
Parent/guardian education			
Secondary or less	1.00	1.00	1.00
College	1.12 (0.90, 1.40)	0.82 (0.51, 1.29)	0.89 (0.53, 1.49)
University	0.99 (0.80, 1.22)	0.60 (0.39, 0.89)*–	0.78 (0.49, 1.24)
Missing	0.70 (0.22, 1.86)	0.70 (0.22, 2.23)	0.24 (0.03, 2.35)
Household income			
20, 000 or less	1.00	1.00	1.00
20, 001 to 60,000	0.64 (0.55, 1.01)	0.63 (0.35, 1.14)	0.63 (0.35, 1.13)
More than 60,000	0.74 (0.44, 0.88)*-	0.42 (0.22, 0.80)*–	0.34 (0.18, 0.63)*–
Missing	0.62 (0.61, 1.20)	0.71 (0.36, 1.42)	0.75 (0.39, 1.47)
Parent/guardian marital status			
Single/divorced/separated/ widowed	1.00	1.00	1.00
Married/common-law	0.98 (0.78, 1.25)	0.76 (0.49, 1.19)	1.39 (0.80, 2.42)
Missing	1.03 (0.32, 3.34)	1.32 (0.35, 4.97)	3.49 (0.36, 33.90)

*$p < 0.05$

\+ Increased probability of outcome variable compared to referent group

– Decreased probability of outcome variable compared to referent group

Table G9

Descriptive statistics for internalizing symptoms survey questions by having a primary physician-diagnosis of an internalizing disorder between 2003-2010, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

Internalizing symptoms survey questions	Population (%)	Internalizing disorder between 2003 - 2010 (%)	
		Yes	No
I feel like I don't have any friends			
Never or almost never	70.95	21.84	78.16
Sometimes	22.58	30.00	70.00
Often or almost always	6.47	28.62	71.38
I like myself (+)			
Never or almost never	6.20	26.21	73.79
Sometimes	23.79	28.64	71.36
Often or almost always	69.53	22.38	77.62
Missing	0.49	- - - -	- - - -
I like the way I look (+)			
Never or almost never	7.24	29.72	70.28
Sometimes	39.16	24.62	75.38
Often or almost always	53.34	23.02	76.98
Missing	0.26	- - - -	- - - -
My future looks good to me (+)			
Never or almost never	4.51	23.98	76.02
Sometimes	35.43	26.52	73.48
Often or almost always	59.70	22.79	77.21
Missing	0.36	- - - -	- - - -
I feel unhappy or sad			
Never or almost never	37.71	20.49	79.51
Sometimes	56.41	26.02	73.98
Often or almost always	5.39	29.42	70.58
Missing	0.49	- - - -	- - - -
I worry a lot			
Never or almost never	49.82	21.13	78.87
Sometimes	40.40	25.73	74.27
Often or almost always	9.25	32.99	67.01
Missing	0.53	- - - -	- - - -
I cry a lot			
Never or almost never	68.34	21.73	78.27
Sometimes	25.85	28.93	71.07
Often or almost always	5.13	32.29	67.71
Missing	0.68	- - - -	- - - -
I have trouble paying attention			
Never or almost never	50.77	21.84	78.16
Sometimes	42.23	25.66	74.34
Often or almost always	7.00	31.43	68.57

*Having a internalizing disorder between 2003-2010 broken down by row percentages

Table G10

Descriptive statistics for peer relationships survey questions by having a primary physician-diagnosis of an internalizing disorder between 2003-2010, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

Peer relationships survey questions	Population (%)	Internalizing disorder between 2003 -2010 (%)	
		Yes	No
In my class I like…			
Most of the kids	70.48	22.77	77.23
Some of the kids	25.69	27.08	72.92
Only 1 or 2 kids	3.22	30.84	69.16
I don't like any of the kids in my class	0.32	10.87	89.13
Missing	0.29	- - - -	- - - -
At recess do you usually play with..			
With more than one other friend	86.63	23.06	76.94
With one other friend	9.74	28.35	71.65
By yourself	3.05	39.31	60.69
Missing	0.58	- - - -	- - - -
How often do you get along with friends?			
Almost always or always	74.79	22.99	77.01
Frequently	15.65	26.07	73.93
Sometimes	7.54	29.87	70.13
Never or almost never	1.55	21.00	79.00
I do not have any friends	0.47	33.39	66.61
How well does your fifth grade child get along with other children his or her age, not including brothers or sisters?			
Very well, no problems	44.07	19.17	80.83
Quite well, hardly any problems	32.93	25.12	74.88
Pretty well, occasional problems	14.35	33.95	66.05
Not too well, frequent problems/Not well at all, constant problems	1.84	45.35	54.65
Missing	6.81	- - - -	- - - -
Does your fifth grade child have a close friend or friends with whom he or she plays regularly?			
Yes, many close friends	29.51	21.67	78.33
Yes a few close friends	53.31	23.73	76.27
Yes, 1 close friend	6.25	35.50	64.50
Not at the moment	2.96	25.77	74.23
My child has not had any close friends in the past few years	1.21	36.61	63.39
Missing	6.76	- - - -	- - - -

*Having an internalizing disorder between 2003-2010 broken down by row percentages

Table G11

IRR and 95% CI of the relationship between bullying behaviours and number of primary diagnoses of an internalizing disorder by a physician between 2003-2010 after adjusting for internalizing symptoms and number of primary physician-diagnosed internalizing disorders a child had prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	IRR (95% CI)
Bullying Behaviours	
Not Involved	1.00
Being a victim	1.28 (1.04, 1.59)*+
Being a bully	0.63 (0.43, 0.91)*−
Being a bully-victim	1.26 (0.78, 2.05)
Physician-diagnosed internalizing disorder before 2003	1.33 (1.06, 1.67)*+
Internalizing symptoms	
Low internalizing symptoms	1.00
High internalizing symptoms	1.52 (1.23, 1.86)*+
Missing	0.93 (0.58, 1.47)

*p <0.05

+ Increased rate of outcome variable compared to referent group

− Decreased rate of outcome variable compared to referent group

Table G12

IRR and 95% CI of the relationship between bullying behaviours and number of primary diagnoses of an internalizing disorder by a physician between 2003-2010 when excluding children who had a primary diagnoses of an internalizing disorder prior to 2003, Grade five students, Children's Lifestyle and School Performance Study (CLASS), Nova Scotia, Canada, 2003.

	IRR (95% CI)
Bullying behaviours	
Not Involved	1.00
Being a victim	1.30 (1.05, 1.61)*+
Being a bully	0.56 (0.36, 0.89)*−
Being a bully-victim	1.18 (0.72, 1.91)
Internalizing symptoms	
Low internalizing symptoms	1.00
High internalizing symptoms	1.57 (1.28, 1.93)*+
Missing	0.88 (0.54, 1.43)
Gender	
Boys	1.00
Girls	1.61 (1.33, 1.95)*+
Parent/guardian education	
Secondary or less	1.00
College	0.75 (0.55, 1.03)
University	0.75 (0.60, 0.94)*−
Missing	5.21 (1.37, 19.92)*+
Household income	
20, 000 or less	1.00
20, 001 to 60,000	0.92 (0.69, 1.24)
More than 60,000	0.79 (0.55, 1.13)
Missing	0.62 (0.45, 0.85)*−
Parent/guardian marital status	
Single/divorced/separated/widowed	1.00
Married/common-law	0.88 (0.67, 1.15)
Missing	0.21 (0.05, 0.86)*−

*$p < 0.05$

\+ Increased rate of outcome variable compared to referent group

− Decreased rate of outcome variable compared to referent group