HEALTH BEHAVIOUR, SELF-EFFICACY AND PERCEIVED CONTROL IN SCHOOL- AGE CHILDREN: FOUNDATIONS FOR OBESITY PREVENTION

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ABSTRACT

Understanding children's health, as it influences their present and future lives is essential for many reasons. With the recent rapid increase in overweight and obesity among children and adolescents worldwide, the need to study the factors that may be contributing to this health-compromising condition has also escalated.

This pilot study undertook to establish a baseline health profile for 9-11 year olds in a south central Canadian community, with a focus on healthy eating and physical activity determinants of health, and to investigate the relationship between health behaviours (healthy eating and physical activity) and the psychosocial correlates of self-efficacy (SE) and multidimensional health locus of control (MHLC). Contextual understanding was added through qualitative input from teachers and parents.

The study found that, overall, this was a predominantly healthy, economically well-off group of children who lived in stable family environments that were health promoting. The majority reported healthy eating habits and were very physically active. However, there were small but significant groups of children who reported poor health, lived with smokers, did not get regular dental care, irregularly ate healthfully, or were not physically active. Further, rates of sedentary activity, in particular TV watching, were fairly high. Based on physical measurements, rates of overweight and obesity were similarly high to those found in national surveys. Due to sample size limitations, overall health status was used as a proxy measure for overweight and obesity.

Gender differences related to health status confirmed the research consensus that girls report poor health significantly more frequently than boys. However, no other gender differences were evident. Trends were identified suggesting that living in rural locations and living with both parents may influence health status. Though socioeconomic status indicators used in this study were not significantly associated with overall health, these trends suggest that related factors such as family structure and geographic location may be important.

Investigation of the associations among the psychosocial variables found that physical activity SE was significantly associated with health status, but nutrition SE was not. However, children who were high in either nutrition SE or physical activity SE were also significantly more likely to eat healthfully and be more physically active. These findings suggest that self-efficacy may be an important psychosocial correlate of health status and its related determinants. Multidimensional health locus of control for nutrition was also found to be significantly associated with healthy eating and physical activity. Though the other associations found for health locus of control variables were different from the SE variables, they were, nonetheless, important. Healthy children were more likely to report being in control of their health.

Physical activity and physical activity SE were the only strong predictors of health status identified by regression analysis. This finding supports the importance of physical activity to

health, and hence to reduction of overweight and obesity, but additionally adds to the uncertainty of the contribution of nutrition. It may be that children, at this age, are more likely to see themselves as capable in the realm of physical activity than nutrition.

Teachers' comments suggested that this might be the case, and also emphasized a lack of good health practices among their students and the importance of positive parental influences. Similarly, parents reinforced the view that children need boundaries, while being given opportunities to be involved in decision making related to eating healthfully and being physically active.

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1. INTRODUCTION

1.1 Overview and Problem Statement

It is only in recent years that cultural norms have begun to react to what health researchers and practitioners have known about obesity and overweight for several decades. The mounting evidence of global increases in overweight and obesity has finally led to oversize airline and automobile seats, clothing, kayaks, hospital beds and mattresses, to name a few of the super-sized products now available. "Even the 'final' industry has acquiesced – Goliath Casket, Inc, of Lynn, Ind, now provides several lines of oversize resting places for people weighing up to 700 lbs, for whom conventional caskets are much too small. Of course, the tragedy is that these caskets are holding many who die too young" (Eckel, Daniels, Jacobs & Robertson, 2005, p. 1866).

Overweight and obesity are chronic disorders that affect many millions of children, youth and adults worldwide. These conditions represent a continuum of excess body fat (adiposity) that can lead to compromised health, and are most often defined by "body mass index" (BMI), a weight to height ratio, with BMI > 25 denoting 'overweight' and BMI $\geq$ 30 denoting 'obesity.' They develop when an individual's energy intake exceeds energy expenditure over a long period of time. It may be that this imbalance is small but chronic, making it difficult to precisely identify and measure (Goran, 1998; Sun, Schultz, & Maffeis, 2004). Adiposity is caused by a complex set of biological, behavioural, social and environmental factors, including genetics, metabolic rate, diet, physical activity behaviours, and related societal factors such as socioeconomic status, ethnicity and poverty. It is a significant risk factor for several serious and potentially life-threatening health problems, including diabetes, coronary heart disease, high blood pressure, stroke and some types of cancers, as well as psychological disorders such as depression, eating disorders, low self esteem and body image problems. Less life threatening are other health consequences including gall bladder disease, sleep apnea, breathing problems, osteoarthritis, complications of pregnancy, birth defects and infertility (WHO, 2005).

The potential for premature death looms large as obesity continues to increase in most developed countries and increasingly in the developing world (Rigby, 2002; Tohill, 2005). Levels of obesity in much of the world have risen steadily over the past 20-30 years. Estimates indicate that, in 2002, more than 300 million people worldwide were obese and 1.1 billion people were overweight. Of these, 155 million school-age children and 22 million children under the age of 5 were overweight (WHO, 2005). Recent predictions suggest that current trends in increasing obesity threaten to negatively impact life expectancy and it could start to decline for the first time in two centuries (Olshansky et al., 2005). These trends affect many people, regardless of socioeconomic strata, age, gender, geographic location, race and ethnicity. But the largest increases are being seen among children, especially adolescents, and minorities. Olshansky and colleagues suggest that, because being overweight in childhood tracks into adulthood, the negative effects on the health and longevity for today's youth will worsen in the future if they are left unchecked.

In 2004, 23% (5.5 million) of Canadian adults were obese, and 36% (8.6 million) were overweight. The current rate of obesity among Canadians has increased dramatically from 14% in 1978/79 while the rate of overweight has increased only marginally from 35% (Tjepkema and Shields, 2005a). Similarly, obesity is rapidly increasing in the US, where it rose from 15% in 1976-80 to 25% in 2004 (Glendening, Hearne, Segal, Juliano, & Earls, 2005). These trends are expected to continue, with the International Obesity Task Force (IOTF) projecting that, by the year 2025, obesity rates could reach 45-50% in the US, 30-40% in Australia, England and Mauritius, and over 20% in Brazil (Rigby, 2002).

Although recent conflicting findings related to the number of premature deaths due to obesity in the US (Flegal, 2005), highlight the challenges of determining the overall size of the impact of obesity and overweight on population health, the enormity of their present and future consequences cannot be dismissed. In 2001, obesity ranked 7th in risk factors leading to death among both developed and developing countries (WHO, 2005). Researchers estimate that between 1985 and 2000, overweight and obesity accounted for ~57,000 deaths in Canada (Katzmarzyk & Ardern, 2004).

The social and economic consequences of obesity are also significant. All members of society can be affected by obesity and overweight – children, youth, adults, men and women, urban and rural dwellers. The social burden of prejudice, ostracism, psychological stressors, and reduced educational and employment opportunities experienced by those who are overweight or obese significantly impacts quality of life and well being (WHO, 1998).

The economic burden of obesity in Canada, including both direct and indirect costs was estimated to be $4.3 billion or ~2.2% of total health care costs in 2001. Of this total, direct costs were $1.6 billion and indirect costs were $2.7 billion (Katzmarzyk and Janssen, 2004). These researchers also estimated the total cost of physical inactivity, an often cited determinant of obesity, to be $5.3 billion, or 2.6% of total Canadian health care expenditure in 2001. They noted that the impact of overweight was not included in their analysis and as a result, the total economic burden of excess weight in Canada was underestimated. The cost of obesity in direct medical expenditures in the US was estimated at $93 billion in 2002 (Finkelstein, Fiebelkorn & Wang, 2003), and up to $97 billion in 2003, according to a review of the research presented at the June 2005 14th European Congress on Obesity (Reaney, 2005).

Obesity costs in the US are approximately 7% of health care expenditures. Indirect costs including lost productivity or function due to mortality or morbidity would add substantially to this cost, perhaps exceeding it (Colditz, 2005). Worldwide, direct costs have been estimated to range from 2-7% of national health care budgets (Roux & Donaldson, 2003; WHO, 2002). The health, social and economic costs of obesity in Canada and other countries world-wide are strong indicators of the important and urgent need for effective prevention and treatment of obesity and overweight. "Despite the health and economic consequences of obesity which affect more than 300 million people worldwide including a growing number of children

and adolescents, health experts believe it is one of the most neglected public health issues" (Reaney, 2005).

Childhood Obesity

Over the past three decades, dramatic increases in overweight and obesity have occurred in all age groups, but children and adolescents are particularly vulnerable. At the 14th European Congress on Obesity, Chairman Constantine Tsigos stressed that prevention efforts must focus on the young because excess weight in children is linked to health risks that increase the odds of developing diabetes, heart disease, and stroke (NewsTarget.com, 2005). Ten percent of the world's children are affected by obesity and rates are rising in developing as well as developed countries (WHO, 2005). In 2002, 32% of American children and adolescents between the ages of 6 and 19 were at risk of overweight or overweight (a doubling over the past 30 years), and 17% were overweight. Overweight among children aged 6-11 rose 12%, from 4% in 1971-74 to 16 % in 1999-2000, and adolescents 12-19 years old experienced a 10% increase (6-16%) over the same period (Hedley et al., 2004).

In 2004, 29% of Canadian children aged 2-17 were overweight or obese, and of these, 9% were classified as obese, in comparison to 15% and 3% respectively, in 1978/79. Further, within this age range, overweight and obesity rates increased with age. For the age groups 2-5, 6-11, and 12-17, the overall rates of overweight were 21%, 26% and 29% respectively, of which 6%, 8% and 9% were obese. Slightly more boys than girls were obese (9% vs. 7%), the difference being almost entirely in the 12-17 age group. More children from low-middle and upper-middle income families were overweight or obese than either low- or high-income families, and household education level was found to be inversely related to overweight and obesity rates (Tjepkema & Shields, 2005b).

Childhood obesity is even more serious in the context of adult obesity and the likely link between the two (Dietz & Gortmaker, 2000; Tremblay & Willms, 2000; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). A number of risk factors and related health consequences have been found to be associated with childhood obesity. In particular, cardiovascular disease (CVD) and type 2 diabetes risk factors develop early in life and are prevalent in overweight children (Ball & McCargar, 2003; Goran, Ball & Cruz, 2003). While genetic predisposition to being overweight plays an important role in childhood obesity, other known risk factors including high-fat, low-fibre diet and low physical activity levels are believed to be modifiable.

Trends in risk factor indicators also confirm that poor diet and lack of physical activity are becoming increasingly prevalent among children. Overall, children are eating more high-fat, high-sugar foods, fewer raw fruits and vegetables, and are getting less physical exercise (Boyce, 2004). Sedentary behaviour may be related to obesity and a relationship has been found between television watching and risk of being overweight or obese (e.g., Berkey et al., 2000; Dietz & Gortmaker, 2001). Watching TV has also been found to be negatively related to eating frequency and nutrition. As critical risk factors become more prevalent

among children, so do overweight and obesity. These patterns, once set in childhood and adolescence, can become habits for life with serious and possibly irreversible consequences for health and longevity.

Research Questions

This study was based on the premise that more needs to be known about children's health status as it relates to both healthy eating and physical activity. It further sought to investigate what contribution two psychosocial constructs make to understanding children's health. The following questions directed this research:

- What is the health status of children aged 9-11 in a south central Canadian community, focusing on their eating habits and physical activity levels, and what are the determinants or mediators of eating healthfully and being physically active during childhood?

  Specifically, associations among demographic and socioeconomic variables, and health status (including smoke exposure and dental care variables), healthy eating and physical activity indicators were investigated.

- How do children perceive their capability to eat healthfully and be physically active and their ability to control their health and what they eat?

  Associations of four psychosocial variables (self-efficacy for nutrition and physical activity, and multidimensional health locus of control for health and nutrition) with variables related to health status, healthy eating and physical activity were explored.

1.2 Rationale

Alarming increases in levels of overweight and obesity among Canadian children and youth have become a focus for health researchers and practitioners. Although the amount of research in this area has escalated dramatically in the past decade, the field is still very young. More research that investigates the relationships between eating habits, physical activity levels and the health status of children is needed. There is significant support in the literature for a focus on population influences, as well as individual behaviour change, rather than knowledge acquisition or attitude change, and demonstrable need for attention to measurement issues and health outcome indicators related to children's health (e.g., Astrup, Hill, & Rossner, 2004; Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003; Hill & Trowbridge, 1998; Jeffery & Utter, 2003; Koplan & Dietz, 1999; Lobstein, Baur, & Uauy, 2004; Raine, 2004; Schwartz & Puhl, 2003; Swinburn, Gill, & Kumanyika, 2005).

The research's first purpose was to provide a preliminary health profile of 9-11 year olds and is intended to add to our understanding of children's health, and the related determinants of healthy eating and physical activity. The study broadly aimed to initiate a data-gathering process that could be undertaken on an ongoing basis to provide the education and the public health communities with important aggregated information on the health of school-age children. Although national surveys provide important information on trends and prevalence for large populations, local information is also needed for smaller

regions of the country to provide an empirical basis upon which to define and understand the rapid increase in childhood obesity and to develop and evaluate program interventions. The intent of this study was to initiate data gathering required to determine children's health status, and healthy eating and physical activity levels. Included were data on demographics, socioeconomic status, health status indicators, self-reported behaviours related to diet and physical activity, and children's perceptions of control over critical factors related to their health, what they eat and how much physical activity they get. The sample consisted of Grade 4 and 5 elementary school children from a large rural school board in south central Ontario, Canada.

The study's second purpose was to advance the understanding of the psychosocial constructs that play a role in children's perceived ability to control and change their health behaviours related to nutrition and physical activity. It attempted to assess the utility of two psychosocial mediators – self-efficacy from Bandura's Social Cognitive Theory (1986; 1997) and the multidimensional health locus of control developed by Wallston and colleagues (1978).

Although potentially measuring similar psychosocial processes, self-efficacy and perceived locus of control are related but different constructs. Self-efficacy represents an internal focus on belief in one's own capability to do something, while, in this study, perceived locus of control focuses on both children's internal control and how much they control externalities (food choice and availability, and being physically active) that affect health and that are predominantly the domain of "powerful others," in this case, parents and other adults.

The study's investigation of behaviour change theory and psychosocial constructs related to children's health attests to the importance of health behaviour research grounded in established theory. In order to better understand how to positively impact health behaviours and the skills needed to perform these behaviours, the study included measures from existing and proven research tools specifically focused on these constructs. It was intended that this aspect of the research would assist in furthering our understanding of the relationship between behavioural and social influences of health. This information can be important input into school and community decision making and program development related to childhood obesity prevention.

The study concludes with a consideration of the research findings in the context of a more broadly based social ecological perspective of obesity prevention, which places individual behaviour change in the larger social context. Included are input from teachers and parents which provide perspectives on the relative importance of school and parental influences and practices on children's health. In this way, the findings aim to emphasize the need for comprehensive research that addresses all levels of influence on overweight and obesity – behavioural, social and environmental.

2. LITERATURE REVIEW

2.1 Literature Search Strategy and Search Terms

Databases used to identify the literature upon which the study was conceived and researched included CINAHL (Citations in Nursing and Allied Health Literature), National Library of Medicine's NLM Gateway (MEDLINE/PubMed and MEDLINE*plus*), PsychINFO, EPHPP (Effective Public Health Practice Project), Cochrane Database of Systematic Reviews and Central Register of Controlled Trials, Centre for Reviews and Dissemination (CRD) and Proquest. All were searched for English language, peer-reviewed articles, and grey literature including government and public health reports. Most retrieved documents were published after 1990, but the search was not time-limited.

The study of childhood obesity, health status and application of psychosocial constructs is relatively young. As a result the searches were intentionally broad. The terms used were varying combinations of three categories:

1) Health status: child$, obesity, overweight, health
2) Health determinants: nutrition, diet, physical activity, physical inactivity, sedentary activity
3) Psychosocial factors: psychosocial correlates, mediators, behaviour, self-efficacy, health locus of control

The search terms child$ AND obesity were used to search a limited number of journals including Obesity Reviews, Obesity Research and Journal of the American Medical Association (JAMA). In addition, using a snowball or chaining approach, reference lists of obtained literature were checked for additional relevant articles. Abstracts of relevant hits were scanned for relevance and documents were obtained and reviewed for inclusion in this review. Retrieved documents were entered into bibliographic software.

2.2 Using BMI to Determine Overweight and Obesity

A brief discussion of the use of BMI as the measure by which to determine levels of overweight and obesity in children is included as a result of its extensive use as the principle indicator of overweight or obesity. Ideally, definitions of overweight and obesity should be based on the point at which amount of excess body fat begins to compromise health, or when individuals present symptoms of disease or illness related to and responsive to treatment of overweight (Hubbard, 2000). However, such a criterion does not currently exist. Because BMI is the criterion upon which health status related to body mass and fat composition is most often determined by researchers and health care professionals alike, it is crucial to use BMI scores with caution.

It is important to recognize that BMI is only one indicator of health status, and that different studies use different BMI standards. Hubbard (2000) recommended using BMI as a guideline rather than a label, keeping in mind that it does not provide any information about fat distribution, often a key factor in weight-related health risk factors. The differences

among overweight and obesity in several ethnic populations are more likely related to fat distribution, in particular intra-abdominal or visceral fat (measured by waist circumference), than BMI alone. He comments that BMI also represents only one aspect of a continuum of health-related risk factors for increasing weight, and regardless of BMI, inappropriate weight gain is a reason for concern. This is especially important for children and adolescents, where preventive actions can more readily be taken before they become overweight.

It has been recognized for some time that the standard adult BMI categories are not appropriate to use with children and adolescents. As a result, standards specific to these age groups have been developed. The two most commonly used are the Centers for Disease Control (CDC) BMI-for-age growth charts, and the International Obesity Task Force (IOTF) BMI international cut off points (Cole, Bellizzi, Flegal, & Dietz, 2000; Flegal, Ogden, Wei, Kuczmarski, & Johnson, 2001). The CDC reference values are a revised version of earlier US growth charts, based on national survey data and intended for use with American children and adolescents. The growth charts include percentiles for ages 2-20, give values for each month of age, and are gender specific. BMI between the 85th and 95th percentile is labelled at 'risk of overweight,' and at or above the 95th percentile is labelled 'overweight.'

In contrast, the international cut off points are smoothed percentiles and were chosen to match adult BMI cutoffs of 25 (overweight) and 30 (obese) at age 18 years, without specifying the centiles in advance. The centiles were estimated from combining six large nationally representative sets of data. The intent was to create a set of cut off values that were less arbitrary and internationally based, and thus could be used for international prevalence comparisons of childhood and adolescent overweight and obesity. A comparison of prevalence of overweight in American children using both standards (Flegal et al., 2001) found that the international method produced lower prevalence estimates for boys between the ages of 2 and 8, slightly lower estimates for 9-14 year olds and higher estimates for 15-19 year olds. For girls, the international estimates for risk of overweight (overweight) were 4-5% lower for 2-5 year olds, similar to CDC estimates for 6-14 year olds, and higher for 15-19 year olds. The differences for overweight (obesity) estimates were consistently much higher, especially for boys, with the exception of the oldest ages (18-19 years old) where the international estimates were lower for both sexes. The differences between the two methods tended to occur primarily in the youngest and oldest age groups and were sometimes as large as 10%.

Flegal and colleagues (2001) state that the CDC method is the appropriate one to use in the US, while Cole et al. (2000) conclude that the international method "probably reflects Western populations adequately, but lacks representation from other parts of the world" (p. 5). Currently, it is likely the best standard to use when attempting international comparisons of overweight and obesity in children and adolescents. Both methods have been used in the studies included in this review. American studies almost exclusively used the CDC growth charts, international studies used the international standards, and Canadian studies used both.

The CDC BMI-for-age charts were used in the present research based on the recommendation of a collaboration of the Dieticians of Canada, the Canadian Paediatric Society, the College of Family Physicians of Canada, and the Community Health Nurses Association (Dieticians of Canada, 2004b). These groups issued a public policy statement in 2004 reviewing the use of growth and BMI charts for assessing and monitoring growth of children. It was recommended that the most recent CDC BMI-for-age charts be used in Canada, based on the absence of Canadian BMI references. They also recommended the use of the international BMI charts when comparing Canadian BMI prevalence data with other populations.

2.3 Health Status and Obesity in Children

Children's health practices, from the kind and amount of food they eat, the amount of physical activity they get, and whether they engage in health-compromising behaviours (e.g., smoking, unsafe sex) play a key role in determining their health. Many of the practices that are established during childhood and adolescence contribute to health and well being in adulthood. At the same time, children have limited control and decision-making opportunities over many of the choices that will either enhance or threaten their present and future health. Other societal factors, including socioeconomic status (SES), family education levels, income inequities and family composition also significantly affect children's health (CICH, 2000).

Health Canada has identified the following broad range of determinants of children's health: income and social status; employment and work environment; education; social environment; natural and built environments; personal health practices; individual capacity and coping skills; genetic and biological factors; health services and social services; culture; and gender (Health Canada, 1999). The health promotion literature (e.g., Green & Kreuter, 1991; Lonero et al., 1994) similarly emphasizes that health results from the interaction of multiple factors at many levels.

In Canada, the environments that impact children's health are changing. A growing number of children are living in lone-parent families, and step families are becoming a more common family structure. The incidence of low levels of social support is substantially higher for low-income families and these families also are more likely to have parents in poor health. Immigrant families, although they work longer hours, are more likely to be poor (CCSD, 2002).

Economically, rich families in Canada keep getting richer and poor families continue to get poorer. Between 1984 and 1999, the average net wealth of low-income families fell by more than 51%, while it increased 43% among the high-income families. Dwelling costs are taking up a larger proportion of income. As a result, families are the fastest growing group requiring emergency shelter, and in 1996, 75,000 families in Canada experienced hunger, up 21,000 from 1994. Although 75% of parents plan on their children going to university, in 1998, only 28% of university-aged youth did so. Furthermore, children are often excluded from healthy opportunities because of user fee policies, for example, for recreational

activities. Disabled children are excluded due to education policies that limit access to educational assistance and social policies that limit community funding to serve special needs children (CCSD, 2002).

The most recent Health Behaviour in School-aged Children (HBSC) survey for Canada (Boyce, 2004), conducted in 2001/02 confirmed these findings and provided a closer look at self-reported health behaviours of Canadian students between the ages of 11 and 15. Students from affluent families reported being healthy, and satisfied with their lives, lending additional support for the link between socioeconomic status, self-reported health and life satisfaction. However, 13% of students reported at least sometimes going to bed hungry due to lack of food at home. A small but significant proportion of both boys (11%) and girls (17%) reported poor health. Gender and age appear to be important factors, as girls more frequently reported poor health and this increased with age (Currie et al., 2004).

Furthermore, children are challenged to practice healthful behaviours in what is often referred to the "obesogenic" environment (Chopra, Galbraith, & Darnton-Hill, 2002; Lobstein et al., 2004) within which we live. This is an environment that routinely promotes high-fat, high-sugar foods to children and parents as quick, cheap and nutritious. These foods are marketed through the attractive sedentary activity of TV watching. In addition, an entirely new communication media and pastimes on computers are becoming extremely popular among youth. As Lobstein and colleagues (2004) put it, "A child's genetic make-up 'loads the gun' while their environment 'pulls the trigger'" (p. 5). These researchers suggested that although a genetic predisposition for weight gain is important, it is also likely commonplace, and that weight accumulation is highly probable in an obesogenic environment.

The HBSC survey gathered information on Canadian students' healthy living behaviours including nutrition, physical activity, family eating habits, and sedentary activities (Boyce, 2004). Girls ate more nutritious foods such as fruits and vegetables, but skipped breakfast more often and reported doing things to lose weight more frequently. More boys consumed foods high in sugar, salt and caffeine, while both genders preferred regular soft drinks over diet pop and reported high consumptions rates of potato chips, french fries and sweets. Most students ate breakfast five days/week, although this declined noticeably with age.

A third of students reported being involved in vigorous and either organized or free time physical activities more than five times a week, while significantly more boys reported being physically active for at least 60 minutes a day for 5+ days per week. Not surprisingly, students were least physically active in school. For every age group, over 2/3 of the students reported watching at least 2 hours of TV a day, and similarly high percentages of students regularly used the computer to play games.

Body mass index (BMI) levels were calculated from self-reported height and weight measurements. Obesity levels across age groups ranged from 5-7% for boys and 2-4% for girls. Similarly, more boys (15-22%) were overweight than girls (11-14%). These rates are similar to those reported by Tjempka and Shields (2005b) in the 2004 Canadian Community Health Survey (CCHS) for boys at both levels (9% obese and 18% overweight) but

noticeably lower for girls (7% obese and 18% overweight). However, the age range differed in the CCHS survey (2-17 years of age), and height and weight were measured rather than self-reported as in the HBCS survey. These differences point to the ongoing challenges of comparing findings when few data sets use standardized methodologies or measures, as discussed previously.

Prevalence of overweight and obesity are more frequently being linked to type-2 diabetes and cardiovascular disease in children and adolescents (American Diabetes Association, 2000; Ball & McCargar, 2003; Diabetes in Children Adolescents Work Group of the National Diabetes Education Program, 2004; Srinivasan, Myers, & Berenson, 2002). Risk factors for both diseases include increased body and abdominal fat, insulin resistance, ethnicity and onset of puberty (Goran et al., 2003). The health consequences of overweight and obesity for children now and as they become young adults (e.g., renal failure) will affect their quality of life, be debilitating and potentially life-threatening.

A sizeable body of research is developing that seeks to understand and ultimately explain the impact of obesity and overweight on health. Children's health is an important and recent priority for this work. Although there is more American data available on children's health status and obesity, the data on the health of Canadian children and youth presented here provide the context within which to interpret the findings of this study.

Relationship between Childhood and Adult Obesity

There also appears to be a link between obesity in children and adolescents and adult obesity, although there are conflicting findings in the literature. Many studies assert that children who are overweight or obese are more likely to become overweight or obese adults (e.g., Jain et al., 2001; Rivara, Whitaker, Sherman & Cuttler, 2003; Serdula et al., 1993). Whitaker and colleagues (1997, cited in Strauss & Knight, 1999) found that by 3-9 years of age, obese children were 5-9 times more likely to remain obese into adulthood. Serdula et al. (1993) reviewed 17 epidemiologic studies published between 1970 and 1992 and reported that 42-63% of obese school-age children were found to be obese as adults. The risk for becoming an obese adult was 2-6.5 times higher for obese than nonobese children. However, many obese adults were not obese as children. The researchers emphasized several serious limitations of the studies including sample characteristics (young, predominantly white adults), and wide range of estimates due to differences in study designs, definitions of obesity, measurement intervals and population differences. These types of methodological inconsistencies are not uncommon in much of the research to date.

Must, Jacques, Dallal, Bajema, & Dietz (1992) found that overweight in adolescence was associated with an increased risk of a broad range of adverse health effects in adulthood, independent of adult weight. Dietz (1998) reviewed the research on childhood predictors of adult obesity and concluded that the relative contribution of childhood obesity to the prevalence of adult obesity is unclear. He cited a small number of studies that found a relationship, including the Fels sample (Guo et al., 1994, cited in Dietz, 1998) where the odds ratio for adult obesity increased from 2 for obese children who were 1-6 years of age,

to 5-10 for obese 10-14 year olds. Other studies that tracked obesity found correlation coefficients of r=.54-.72. Dietz also cited a study that found that the prevalence of adult obesity was more likely in adults who were obese as adolescents, although other studies indicated that only 15-30% of adult obesity results from childhood or adolescent obesity.

Troiano and Flegal (1998) examined prevalence of overweight and risk of overweight in children and adolescents ages 6-17 in the US from 1988 to 1994. They found that both increased dramatically over the six years, but that, although in some population subgroups, more than 30% were either at risk of overweight or overweight, over the entire range of BMI, most of the change occurred in the heaviest groups. What was not clear was whether this change was a result of the entire population becoming heavier or whether only the heavy children were getting even heavier. Steinbeck (2001) cited evidence that these increases are occurring predominantly at the higher end of the BMI distribution, and in fact, the heavier children are becoming heavier. Troiano and Flegal (1998) also reported that the likelihood of overweight continuing into adulthood is greater with more severe overweight, and concluded that the high prevalence of overweight in these youth was likely to continue, if not increase. Because adults are similarly becoming heavier, it may be that behaviours that contribute to obesity will be transmitted within the family and also influence children's weight.

There is consensus in the literature that birth weight and early physical maturation affect adult weight (Baranowski et al., 2000; Dietz & Gortmaker, 2001; Gillman, in Lederman, Akabas, & Moore, 2004, pp. 1147-1152), and that the presence of overweight in adolescence tracks into adulthood. How overweight in childhood fits into this picture is not as clear.

Poverty and Children's Health

One child in five in Canada lives in poverty and rates of poverty for families with children have increased by 60% since 1989 (Health Canada, 1999). Regardless of how poverty is defined (income, occupation, social class or education level), a direct link has been found with children's health, including increased health problems, disability and death (Hertzman, cited in Health Canada, 1999). Children who live in poverty encounter more obstacles to healthy development and are at increased risk for a range of negative health outcomes (CICH, 2001).

Evidence in the public health, research and intervention literature points to the relationship between socioeconomic status and children's health (Carlson & Senauer, 2003; Currie et al., 2004; Johnson-Down, O'Loughlin, Koski, & Gray-Donald, 1997; Le Petit & Bertholet, 2005; Starfield, Robertson & Riley, 2002; Whitaker et al., 1997). Health Canada (1999) has identified income as being the single most important determinant of health. Children's physical and mental health, cognitive and social development, and academic achievement are all influenced by family income. Inadequate income inevitably means that at best, a family's basic needs will be met, with nothing left over for other necessities such as dental care, transportation, clothing or child care. Neither will there be resources for discretionary

spending that promotes healthy development including recreation, organized sports, and healthier foods. Up to 70% of a low-income family's budget can be spent on food and shelter (HKPR, 2003a). Children in low-income families are at greater risk for injury, disability, hospitalization and death, and they are more likely to have mental health problems and lower academic achievement than children in higher SES families (Health Canada, 1999). Low income affects housing, food security and access to any type of opportunity that is financially based, be it educational, recreational, or physical activity related.

In their study on geographic and demographic variation in the prevalence of overweight and obesity in Canadian children, Willms, Tremblay & Katzmarzyk (2003) confirmed the trend in developed countries for obesity to be inversely related to SES and income. However, they also stated that the overall increase in obesity and related disease, most notably type-2 diabetes, is occurring in all Canadian children, not only those from low socioeconomic circumstances. They found that the odds of a child being overweight decreases ~3% with each $10,000 increment in family income and ~4% with each additional year of father's education.

Among adults, especially women, there appears to be a strong and consistent inverse relationship between SES and obesity. However, not all findings suggest as strong a relationship for children. In an analysis of the US National Health and Nutrition Examination Survey data (NHANES III) data, Troiano and Flegal (1998) found no relationship between family income and overweight prevalence for non-Hispanic black and Mexican American children and adolescents. They commented that studies of children find a weaker and less consistent relationship between SES and overweight.

A comprehensive review of the relationship between childhood obesity and SES by Sobal and Stunkard (cited in Strauss & Knight, 1999) found that about a third of the studies showed an inverse relationship between childhood obesity and SES, a third showed a positive relationship, and a third found no relationship. In their prospective study to clarify the relationship between home environment, SES and the development of obesity in children up to age 8, Strauss and Knight (1999) found that low cognitive stimulation was associated with increased risk of obesity among children and that low stimulation was consistently found among single mothers and minorities as well as those with the lowest income and education. They concluded that decreases in the risk of childhood obesity are associated with highly stimulating home environments, and hypothesized that children raised in stimulating and interactive home environments are more likely to be physically active and less likely to engage in sedentary activities such as watching TV.

Although there is little Canadian data on the relationship between ethnicity and obesity, a study conducted by Johnson-Down and colleagues (1997) found a very high prevalence of overweight and obesity among a low income multiethnic inner city sample of Canadian school children – 42% of boys and 32% of girls were overweight and half of these children were obese. American studies (e.g., Hedley et al., 2004; Strauss & Pollack, 2001;

Thorpe et al., 2004; Troiano & Flegal, 1998) found similar patterns of high prevalence of overweight and obesity among some ethnic groups, although again, different studies find different associations. Some of the ethnic groups identified as having higher rates of obesity and overweight include non-Hispanic black, Mexican American, African American and Hispanic children and adults. However, many studies emphasize that overall and significant increases in overweight and obesity over the past 2-3 decades are evident in both genders and all age groups, races, and educational levels for populations worldwide (Mokdad et al., 2003). In developing countries, child obesity is most prevalent in higher SES groups, although, this picture is changing, as increases in child obesity are also being found among the urban poor (Chopra et al., 2002; Lobstein et al., 2004). Lobstein and colleagues (2004) hypothesize that this may be the due to adoption of westernized diets coinciding with the traditional pattern of undernutrition. This 'pandemic' represents a broadly-based and rapidly increasing health condition which is not easily diagnosed early, treated or most importantly, prevented.

The Importance of Targeting School-Age Children

If it is hoped to effectively influence the rapidly increasing incidence of obesity and overweight in Canada, it is critical to initiate concerted efforts aimed at the most vulnerable segment of our population – our children. It is this group that has the least control over their nutritional intake and physical activity levels, and it is at these early ages that life-long patterns of eating and exercise are formed. However, as children reach late childhood (ages 9-12), they are entering a time of fairly rapid physical and emotional transition from childhood to adolescence. Children in this age group are already well into the development of independent thinking and exploring their ability to make decisions on their own. They are becoming more responsible for making choices about what they eat and what types of physical activities they participate in. At the same time, they are beginning to understand the importance of views other than their own and to feel the effects of peer pressure.

During this developmental period, social, intellectual, psychological and emotional changes are experienced. Expanded social relationships help children develop values, and problem-solving skills, achieve greater independence, and form attitudes towards society and behaviour towards others (Health Canada, 1999).

Although early childhood experiences will have already exerted significant influence on children, consolidation of a broad range of behaviours, attitudes and beliefs commences in late childhood and will set the stage for further consolidation as they move into adolescence (Health Canada, 1999). For this reason, it is important to know more about the health status of this age group, and the factors that most critically affect their health and well being, which will be carried into adolescence and adulthood. Furthermore, the most recent HBSC findings (Boyce, 2004; Ma & Zhang, 2002) indicated that health status declines across age in adolescents. For this reason, it is critical that children have well established healthy behaviours so that they will have a solid foundation upon which to make good health decisions as they move into the challenging times of adolescence. Family income, lifestyle

choices, nutrition, fitness, and family relationships all play important roles in determining the health of preadolescent children.

2.4 Healthy Eating and Physical Activity – Essential Ingredients for Good Health

As previously defined, obesity is a complex disorder of excess body fat. Body fat is the "net result of what goes in and what comes out. What goes in has to do with portion sizes, meals and snack frequencies and the energy density of food. What comes out is basal energy expenditure, obligatory energy expenditure, adaptive thermogenesis, and physical activity" (Kramer in Lederman, Akabas, & Moore, 2004, pp. 1155-1156).

The modifiable factors in the intake and expenditure formula are diet and physical activity. Recently the research literature has seen an upsurge in publications examining either or both of these factors, with often divergent views and conclusions on the relative contributions of each to what the WHO calls the "global obesity epidemic." Although the intent of this research is to emphasize the importance of a comprehensive and integrated approach to describing and understanding the determinants of obesity and health, diet and physical activity are very different mediators, with different motivators, behaviours and consequences in children's lives. Thus a brief discussion of each will precede an integration of the impact of both factors on children's overweight and health.

Healthy Eating

The energy intake side of the obesity equation is focused on food intake, and food intake is a largely a matter of what is eaten and how often, and possibly where. The factors that influence food consumption are food availability and food choice or preferences. For children, parents play a key role – they provide children's genetic make-up and they create the parameters of the environment within which children are nurtured, develop and grow.

Diet and Health Outcomes in Children

There is evidence to suggest that diet is a primary cause of the unprecedented and rapid increase in overweight that is taking place in Canada and worldwide. Overweight and obesity are associated with diets high in fat and low in complex carbohydrates, and parental obesity and intake of fat are associated with these factors in children (Birch & Fisher, 1998). It may be that a genetic predisposition exists for high-fat diets and low levels of physical activity, but modifiable environmental influences must also play important roles.

Dietary fat may play an important role in the regulation of energy intake, displacing more nutritious foods containing complex carbohydrates and fibre. Because diets high in fat are more likely to be low in complex carbohydrates, public health messages now routinely advocate increasing the amount of fruits, vegetables, whole grains and low-fat dairy products. However, there is evidence that, overall, fat consumption has decreased noticeably over the past decade or so (Canadian Paediatric Society, 2002; Kramer, in Lederman, Akabas, & Moore, 2004; Sturm, 2005). The heavily promoted relationship between high-fat diets and rises in cholesterol leading to heart disease has had a significant impact on food industry practices. However, given the rapid increases in overweight and

obesity, reducing high fat consumption alone does not positively affect weight loss. The problem is the combination of fats and simple carbohydrates that is common in many diets. Carbohydrates have replaced fat content, but simple sugars that more readily lead to weight gain are replacing complex carbohydrates in many people's diets (Birch & Fisher, 1998).

A consensus in the medical and nutrition literature exists that a diet rich in fruits and vegetables has significant health benefits (Birch & Fisher, 1998; Kirby, Baranowski, Reynolds, Taylor, & Binkley, 1995). Nutrients including vitamin A, beta-carotene, dietary fibre and complex carbohydrates have been found to be protective against CVD and some cancers.

Increased consumption of simple carbohydrates, replacing complex carbohydrates, in conjunction with increased prevalence of high-fat snacking may be strongly related to the recent rapid increases in overweight and obesity worldwide. In an analysis of the HBSC data, Janssen, Katzmarzyk, Boyce, King & Picket (2004) found a negative relationship between fruit consumption and BMI in boys, and a positive relationship between soft drink consumption and overweight in boys, and either overweight or obesity in girls. Interestingly, consumption of sweets, baked goods and potato chips was inversely related to BMI – increased consumption was related to decreases in overweight and obesity, although the specific relationships varied by gender and type of food.

To date, there does not appear to be empirical evidence that consistently demonstrates the tracking of eating habits (practices and preferences) or nutrient intake from childhood to adulthood. Studies have found moderate 6-year tracking of nutrient intake in preschoolers and a correlation of energy intake (per kilogram of body weight) for 13 year olds over a 15-year period indicating moderate stability in obesity risk (Baranowski et al., 2000), but more research is needed in this area.

Factors that Influence Healthy Eating

Food preferences are an important aspect of food intake, and are determined in childhood (Birch & Fisher, 1998; Schwartz & Puhl, 2003). At birth, infants are predisposed to like sweet and salty tastes and dislike bitter and sour tastes. The prevalence of foods that are high in fat, sugar and salt may unfortunately take advantage of this predisposition, to the detriment of our health. Research indicates that children's eating patterns are formed by early experiences that are created primarily by their parents, and that these practices may be promoting obesity (Anonymous, 1997; Birch & Fisher, 1998; Jain et al., 2001; Rivara et al., 2003). Furthermore, as children grow old enough to express food preferences through acceptance and rejection of foods, it is found that they prefer sugar and fat, possibly because they are satiety cues. These preferences are most often the determinants of consumption patterns (Birch & Fisher, 1998). As they grow older, children acquire food preferences for foods that they have been exposed to and like. Repeated exposures are required to develop many food preferences in young children and these stay with them as they move into late childhood and adolescence. Therefore the food environment provided

by parents is a critical determinant of children's food preferences and acceptance (Dixey, Sahota, Atwal, & Turner, 2001; Hill, 2002; Ross, 1995).

However, children can learn to modify innate food preferences and develop and maintain new preferences. Their eating behaviours and food preferences are influenced by factors in the family environment including food availability and accessibility, parental role modeling, knowledge and beliefs, and interactions at meal and eating times (Birch & Fisher, 1998; Hill, 2002). Clearly the family environment and parenting practices are critical influences on children's food preferences and intake, and therefore their weight. By providing and encouraging consumption of high-fat, sugar laden foods, parents are inadvertently promoting obesity in their children. By the time children are old enough to begin controlling what they eat, their preferences for these foods may be well established and difficult to change.

Impact of Dietary Changes

Children are now consuming simple sugars (carbohydrates) in the form of high fructose corn syrup (HFCS) in unprecedented amounts. HFCS has become the inexpensive, easily produced sweetener that is used in just about every commercially prepared, sweetened food that doesn't use artificial sweeteners – carbonated drinks, breakfast cereals, canned foods, baked goods and snacks to name a few. Children's consumption of many of these 'empty-calorie' foods has increased dramatically (Bray, Nielsen, & Popkin, 2004; Enns, Mickle, & Goldman, 2002; Sturm, 2005). HFCS is thought to contribute to high energy intake and weight gain because fructose bypasses the normal energy burning process and doesn't trigger an insulin response. It is more readily turned into fat and stored rather than burned (Bray, 2002).

Bray and colleagues (2004) have documented the simultaneous rise in use of HFCS and obesity levels in the US. Between 1970 and 1990, consumption of HFCS increased more than 1000%, preceding and then tracking the rise in obesity. These researchers suggested that the increased consumption of beverages using HFCS is an important contributor to the obesity epidemic, along with other environmental agents including increased portion size, eating in fast-food restaurants, change in the types of foods in our diet, and decreases in physical activity and smoking. Many children and adolescents in the US consume soft drinks every day (Ludwig, Peterson, & Gortmaker, 2001).

Interestingly, sweetened beverage (soft drinks, and fruit-flavoured drinks) consumption has been found to be negatively related to fruit consumption, and positively related to high-fat vegetable consumption among children (Cullen, Ash, Warneke, & de Moor, 2002). Cullen et al. also found that lower parental education was associated with higher soft drink and sweetened beverage consumption. Children who had the highest consumption of sweetened beverages, not surprisingly, consumed the most calories, and it was hypothesized that the extra calories may contribute to obesity risk. A prospective study by Ludwig, Peterson, & Gortmaker (2001) in which consumption of soft drinks was found to be associated with obesity in children confirms this hypothesis. Soft drink consumption has

also been found to be negatively associated with milk and fruit juice consumption, and positively associated with energy intake, lending support to the possible link between consumption of HFCS and obesity (Harnack, Stang, & Story, 1999).

Similar patterns of increased consumption and high energy intake have been found in the prevalence of snacking among children (Jahns, Siega-Riz, & Popkin, 2001) and types of snacks they eat (Cross, Babicz, & Cushman, 1994). In their study of snacking prevalence among children between 1977 and 1996, Jahns and colleagues found that daily calories from snacks had increased by 30%, representing approximately 25% of energy intake for children and adolescents in the US. This increase was primarily one of fat intake. Snack size has not changed, but frequency of snacking and energy density have changed substantially. Cross et al. (1994) also found that frequency and energy intake from snacking among children has increased. Fruit was preferred by only a third of 5th and 6th Grade students.

Consumption Patterns of Healthy Foods

Many countries now have nutritional objectives that include eating five or more servings of fruits and vegetables a day. However, low consumption rates appear to be the norm in many developed countries. Several studies in Canada, the US and the UK have found that consumption of fruits and vegetables is very low among both adults and children (e.g., Anonymous, 1997; Birch & Fisher, 1998; Gibson, Wardle, & Watts, 1998). A systematic review conducted in the UK also found that children are consuming less than half the recommended 5 servings per day of fruits and vegetables (Thomas et al., 2003). In addition, these researchers found that children in low-income families ate less fruits and vegetables compared to high-income families. Soft drinks are displacing milk as the beverage of choice for many children, and as a result, diets are also calcium poor and sugar rich (Jacobs Starkey, Johnson-Down, & Gray-Donald, 2001). In a cross-sectional study of 1,797 Grades 2 and 5 children in New York State, it was found that 40% of students did not eat vegetables (except for potatoes and tomato sauce), 20% did not eat fruit, and 16% of 5th graders did not eat breakfast (Wolfe & Campbell, 1993).

A qualitative study of school-age children and their parents in the US found that middle to high SES groups reported having a much larger variety of fruits and vegetables available. Low SES families ate at fast-food restaurants more frequently, where children did not order fruits and vegetables, and low SES parents did not provide precut fruits and vegetables to their children very often (Kirby et al, 1995). Research into breakfast consumption has also suggested that there are SES differences associated with dietary quality and energy intake. Between 1965 and 1991, breakfast consumption declined 9% in children aged 8-10 years old and 13-20% in adolescents (Siega-Riz, Popkin, & Carson, 1998). For children aged 1-14, greater breakfast consumption was associated with higher parental incomes. Overall, the quality of breakfasts has improved with lower consumption of whole milk, eggs and bacon, but the researchers suggested that this has been offset by the large percentage of adolescents who do not eat breakfast at all, a factor that may be associated with obesity.

Although Canadian data are less plentiful, it has been found that only 14% of 9-12 year olds eat fruit and vegetables four or more times daily, and less than a quarter of 6-12 year olds eat the recommended daily amounts of fruits and vegetables. Half of this age group doesn't consume any kind of milk product for lunch (Dieticians of Canada, 2004a). Consistent with the US trends that associate obesity with low fruit and vegetable consumption, the 2004 CCHS analysis (Tjempka & Shields, 2004b) found that children and adolescents who ate fruit and vegetables 5 or more times a day were substantially less likely to be overweight or obese than those who ate these foods less frequently.

The Canadian HBSC survey (Boyce, 2004) indicated that relatively high percentages of students in Grades 6-8 ate fruits and vegetables five days a week or more. Over half the boys and 2/3 of the girls reported regularly eating fruits, while 62 and 69% of boys and girls ate vegetables regularly. Vegetables were preferred over fruits and there was a consistent decline in consumption of both foods in the higher grades.

More than a third of boys and over a quarter of girls in Grade 6 reported consuming coke or other sugar sweetened and caffeinated soft drinks five or more days a week. For boys, consumption continued to increase with grade level, while for girls, consumption increased to Grade 8 and then began to decrease, although not to Grade 6 levels. A similar pattern was evident for consumption of potato chips, french fries and sweets. Almost half the Grade 6 students ate potato chips and 30% ate french fries at least twice a week. Thirty-seven percent ate sweets five or more days a week, and for the most part, these levels increased with grade level. Breakfast consumption on weekdays was fairly high (73%) for Grade 6 students but steadily declined to 46% in Grade 10. This suggests that more than a quarter of 11-12 year olds are not regularly eating breakfast, while more than half of adolescents may not be eating breakfast.

Although the levels of healthy eating practices are higher among Canadian children than their counterparts in the US, there are significant proportions of children in both countries whose dietary behaviours may lead to compromised health.

Physical Activity

Some researchers believe that the evidence for increased energy intake being the key contributor to the obesity epidemic is weak, compared to the evidence for the contribution of decreased physical activity (Kramer, in Lederman, Akabas, & Moore, 2004). Kramer pointed to evidence that in Canada, the UK and the US, intake of dietary fat has declined over the past several decades, and used this as the basis for his conclusion that decreasing levels of physical activity are more likely a key factor in the current obesity levels.

Physical Activity and Health Outcomes in Childhood

Certainly, physical activity is a key component of energy balance, on the expenditure side of the equation. Similar to the rationale for improving diet with healthful foods, physical activity in children is seen to be critical to establishing habits that will be carried through adolescence into adulthood and to lowering risk of disease and premature death

(Kohl & Hobbs, 1998). There is consensus in the literature that physical activity is inversely associated with several health outcomes in adults including overall mortality, CVD, diabetes, some cancers, osteoporosis, and overweight and obesity (Kohl, Fulton, & Caspersen, 2000; Simons-Morton, Parcel, O'Hara, Blair, & Pate, 1988).

In her review of the importance of physical activity in the prevention of overweight and obesity in childhood, Steinbeck (2001) found that, in general, physical activity is more likely to be correlated with body fatness than cardiovascular risk. She also cited research to suggest that intensity of activity may be important and that regular physical activity in children provides a health benefit, including protection from accelerated weight gain. Included was the Child and Adolescent Trial for Cardiovascular Health (CATCH) study, which demonstrated that heavier children had more CVD risk factors. Some studies suggest that there is a well-founded relationship between regular exercise and positive health outcomes. Not only is there evidence that physical activity in childhood regulates weight, but that it also influences healthy eating and sleeping, increases self-esteem, and helps establish positive behaviours that continue into adulthood (Health Canada, 1999).

Consistent with evidence from most cross-sectional studies, a prospective longitudinal study of a large sample of 10-15 year olds in the US found that an increase in recreational physical activity over one year was associated with a relative BMI decrease in girls and overweight boys (Berkey, Rockett, Gillman, & Colditz, 2003). In addition, increases in inactivity were associated with larger BMI increases in girls, with most effects being stronger among overweight children.

The HBSC survey of Canadian children (Janssen et al., 2004) found a negative relationship between physical activity and BMI. As physical activity increased, the odds of being overweight or obese decreased, independent of gender. Further, increased TV watching was positively related to the odds of being overweight or obese in both genders. Computer use was not found to be associated with BMI. Tjepkema and Shields (2005b) reported that analysis of the CCHS data did not find an association between physical activity levels and overweight and obesity for children 6-11 years old, although by ages 12-17 this association was significant for boys. Over a third of 6-11 year olds watched TV, played video games or used the computer (consolidated into a "screen time" measure) for more than 2 hours a day. These children were twice as likely to be overweight or obese as their counterparts whose screen time was an hour or less, and they were twice as likely to be obese.

An extensive literature review by Keays and Allison (1995) confirmed the findings in much of the research that physical activity has a positive effect on health and academic outcomes for students, including improved fitness, improved blood pressure and serum lipid levels, positive body composition changes, and positive changes in attitudes, discipline, behaviour and creativity in classroom. In a study that examined the relationships among physical activity, body composition and illness, Cieslak, Frost, and Klentrou (2003) found that physical activity was important for children's resistance to infection. Children, 10-11 years

old, who were more physically active and fit had fewer sick days, while children with excess body fat reported significantly more sick days.

It is likely that adiposity is maintained or supported by lack of physical activity. There is agreement that obese children are less fit and are less likely to participate in vigorous or moderate levels of activity. However, there is no clear consensus on the relationship between physical activity and childhood obesity. This is due to several factors, including methodological challenges such as measurement, data sources, data comparability and most importantly, the complexity of the behaviour and its correlates. For example, measurement of energy expenditure is a complicated process. Although a detailed description is beyond the scope of this paper, the following provides some insight into these complexities. Steinbeck (2001) in discussing energy expenditure in childhood indicated that a study by her group showed that measures of physical activity (physical activity level (PAL)=total energy expenditure/resting energy expenditure) were inversely correlated with body fat measures, but that there were significant gender differences. Inverse correlations between PAL and weight, BMI, fat mass and percentage body fat were significant for prepubertal boys but not girls. This researcher suggested that, for boys, either physical activity level influences body fat or the reverse, but that perhaps the energy intake side of the equation is more relevant for girls.

Tracking of Physical Activity into Adulthood

How likely it is that active children will become active adults is unclear (Steinbeck, 2001). Most of the studies that have investigated this relationship have compared physical activity levels between adolescence and adulthood, and the correlation has been low (r=.05-.20) (Kohl et al., 2000; Telama et al., 2005). In one of a very few studies to examine tracking in school-age children, Telama and colleagues used data from the Cardiovascular Risk in Young Finns Study to conduct a 21 year longitudinal study investigating the tracking of leisure-time physical activity from childhood to adulthood. They found that physical activity from ages 9-18 significantly predicted adult physical activity, and further that continuous physical activity in childhood increased the likelihood of being active in adulthood. The tracking correlation was low to moderate in males and low in females, suggesting that other factors also influence physical activity in adulthood. As has been found in other studies, there appears to be a clear gender difference – physical activity tracked better in males than in females. This may be an artifact of measurement but also may reflect gender differences such as differences in childhood physical activity choices (e.g., organized sports vs. non-organized activities). If physical activity was continuous, lasting several years in childhood and adolescence, the probability of being active as an adult was much higher. This, of course, links back to the finding that persistent physical activity reduces health risks, including obesity. The study did not find that type of activity in youth was associated with physical activity level in adulthood.

In a review of obesity prevention literature, Baranowski et al. (2000) reported evidence from one study that found that physical activity tracked at a moderate level in young children, and

another which found that sedentary behaviour tracked at low-moderate levels over 5 years from preadolescence to mid-adolescence.

Factors that Influence Physical Activity

Physical activity is a likely determinant of health, but the reverse is also true. The factors that can influence physical activity are varied and interconnected. They include genetics, demographic factors such as socioeconomic status and ethnicity, parental and peer influences, psychosocial correlates (e.g., self-efficacy and perceived barriers) and environmental influences such as the safety of the physical environment, and availability and accessibility of activities, sports and programs.

Lack of comprehensive research and consensus about the correlates of physical activity in children and adolescents led Sallis and colleagues (2000) to undertake a review that included the entire range of potential correlates, a full age range (3-18 years) and a semiquantitative evaluation of results. The review found that the most consistent and frequent association was with gender – boys are more active than girls. Socioeconomic status was not found to be related to physical activity, although it was not included in many of the reviewed studies. Age was a correlate of physical activity only for adolescents, and no significant correlations were found for weight-related variables – 55 comparisons were reviewed and the results were "indeterminate," (the term used to indicate a lack of consistent findings). The authors concluded that the relationship between weight and physical activity is complex and requires more research.

The findings for children aged 4-12 were reported separately from the adolescent findings and are of most interest here. Of 15 psychosocial variables, intention to be active and preference for physical activity were positively correlated with physical activity, and perceived barriers was negatively related. Self-efficacy, perceived competence and attitudes were found to have inconsistent relations. Of the 18 behavioural variables examined, only healthy diet and previous physical activity were consistently and positively related to physical activity. The relation between time in sedentary activities such as TV watching and physical activity, although a frequently studied behaviour, was indeterminate. Surprisingly, few of the 21 social variables were consistently correlated with physical activity, although parental physical activity and parent participation in children's physical activity were classified as indeterminate, being infrequently found to be positively associated with physical activity. Two of 11 physical environment variables – access to facilities and programs, and time spent outdoors – were positively and consistently related to physical activity.

This review found little overlap in consistently correlated variables for children and adolescents. Gender (male), intention to be active and previous physical activity were the only variables that appeared for both age groups, and methodological differences in the studies of different age groups may be partially responsible. The authors confirmed a notable lack of consistency across studies, finding that only 25-33% of variables appeared to be consistently related to physical activity for either age group. About 20-28% of variables

were found to be indeterminate and 40-50% were not associated with physical activity. Possible explanations included measurement error, sample size, sample characteristics, and different analysis strategies.

Other studies suggested that parental influence, support and activity are particularly important, and variables such as genetics, shared activity, role modeling and increased access are likely mediators (Steinbeck, 2001; Stucky-Ropp & DiLorenzo, 1993). Pate and Sirard (2000) reported that providing financial support, transportation, and being physically active as a parent were associated with having the most physically active children. As the Sallis et al. (2000) review confirmed, socioeconomic status and ethnicity have not been found to be consistently related to physical activity level in either children or adolescents. However, studies of adults have found associations for both, and some studies have found that white children are more active than African-American and Hispanic children and youth (Pate & Sirard, 2000). Further, Steinbeck (2001) reported that objectively measured physical activity in children has been found to be correlated with SES.

The HBSC survey for Canadian youth ages 11, 13 and 15 found that feeling healthy, rating one's life positively, and consuming fruits and vegetables (except for Grade 8 boys) were associated with increases in physical activity. A positive association was also found with being involved in clubs or organizations, and being well integrated socially (except for Grade 10 girls) (Boyce, 2004).

Physical Activity Levels of Children

There is a clear consensus in the literature that children are not regularly physically active enough to establish and maintain the requisite health benefits. Although the establishment of an appropriate standard is difficult and controversial, it is now being recommended that Canadian children be at least moderately physically active for a minimum of 60 minutes a day or vigorously active for at least 30 minutes every day. In the US, recent guidelines suggest that children should be moderately or vigorously active for at least an hour a day.

Information on levels of physical activity among adults is routinely available. In 1996 in the US, 28% of adults were active at recommended levels for health benefit, while 43% were active below recommended levels and 29% were inactive in their leisure time (Pratt, Macera, & Blanton, 1999). These researchers reported similar patterns in other developed countries. They also noted that, in the US, adult physical activity levels had remained consistent over the preceding 15 years. These low rates may have significant health implications for children, as parental role modeling and activity levels likely affect children's physical activity levels. Other studies, however, suggest that there is a significant decline in physical activity level that is age-related (Nelson, Gordon-Larsen, Adair, & Popkin, 2005). Nelson et al. (2005) found that physical activity levels declined from adolescence into young adulthood.

Although there is some data on adolescent physical activity levels, there is almost no data on children's levels. To establish a baseline assessment of physical activity levels among 9-13 year olds in the US, CDC conducted the Youth Media Campaign Longitudinal Study in

2002. It was found that 62% of children did not participate in any organized physical activity outside of school, and that 23% didn't participate in any free-time activities (Duke, Huhman, & Heitzler, 2003). Non-Hispanic black and Hispanic children were significantly less likely than non-Hispanic white children to be involved in organized activities, as were children from low-income and low-education families. Epstein et al. (2001) reviewed studies in youth aged 3-17 that used heart-rate recording to measure physical activity in order to estimate the amount of daily physical activity children get. They found that youth got a large amount of activity during a day, but that they did so in several bouts rather than in one sustained time period. Youth of all ages were physically active at low levels for more than 60 minutes a day, and at moderately vigorous levels for about 30 minutes a day. Children under 12 attained low intensity levels of physical activity for more than 2 hours daily. These rates fall well below the current US guidelines. These findings led to questions about appropriate intensity levels and accumulation patterns for children and adolescents.

In her review on physical activity and obesity prevention, Steinbeck (2001) stated that there are no studies that show that physical activity levels of children have decreased over the time period that overweight and obesity have increased. However, she did not dispute the likelihood that this is the case, citing the documented decrease of physical activity in adults whose environment children share. She concluded, "Ours is a time-poor society, fatigued by non-physical demands and trying to compartmentalize daily living tasks. It is small wonder that physical activity is discarded in this environment" (p. 126).

Sturm (2005), in his review of US societal trend data, reported that 2001 estimates for active travel time for 5-15 year olds add up to about 8 minutes of walking and biking per day and that this would have to increase by 50% to be equivalent to half of a soft drink. He also found that while food consumption patterns of youth have changed dramatically, physical activity patterns have not.

Recent Canadian data (Boyce, 2004) found that 36% of Grade 6 students reported being physically active for a total of at least 60 minutes on five or more days in a typical week. While this proportion stayed fairly consistent for boys in higher grade levels, it declined dramatically for girls. After Grade 7, only about a quarter of girls reported this level of physical activity. Boyce cited national data on youth and young adults (ages 12-24) that confirmed the trend for boys to be more active than girls, and a decline in physical activity level with age for both genders. Somewhat more than a third of students across all grades spent five or more hours a week in vigorous physical activity through informal activities outside of school. About the same proportion participated in organized sports and lessons. Forty-five percent of Grade 6 students reported spending 3 or more hours a day watching TV, and this rose to 2/3 on weekends. Over half of this age group also spent at least an hour a day playing on the computer. Craig, Cameron, Russell, & Beaulieu (2001) reported that, in 2000, 49% of Canadian children 5-12 years old were considered active enough and that girls were less active than boys. They noted that these findings were not significantly different from the baseline year, 1998.

The need for better assessment tools has been identified as a priority for the study of physical activity in children and adolescents (Kohl et al., 2000). In their review of existing methods and studies, Kohl and colleagues concluded that choice of a measure of physical activity assessment is very difficult in the absence of more work toward developing a measurement standard. In the interim, they cautioned using self-report recall methods with children under 10 years of age, and suggested using direct observation and mechanical monitoring. Electronic measurement was recommended as the best method to measure physical activity patterns, especially intensity, over extended periods of time. These researchers also drew attention to the critical need for more studies of physical activity among girls and ethnic minorities.

Sedentary Activity – The Missing Link?

It may be that sedentary activity provides the common denominator between diet and physical activity and increases in overweight and obesity. Not being active, if a predominant behaviour, will lead to health-compromising consequences. Certainly, the more sedentary children are, the less likely they are to be active (Pate & Simard, 2000). However, there are conflicting views on the relationship between sedentary activity and overweight or obesity, with some evidence supporting the existence of a relationship and other studies failing to find a relationship (Troiano & Flegal, 1998).

The Evidence For and Against

Several studies have examined TV viewing, based on the premise that it is a sedentary activity extremely popular with children, and one which has seen substantial increases, somewhat paralleling declines in physical activity. Both cross-sectional and prospective studies have found a relationship between TV watching and obesity (e. g., Berkey et al., 2000; Crespo et al., 2001; Dietz & Gortmaker, 1985; Gortmaker et al., 1996). Epstein et al. (1995) found that reducing access to TV and other sedentary activities through incentives for 8-12 year old children who were obese, led to decreased overweight and percent body fat. These researchers found that decreasing sedentary behaviours had a larger effect than programs aiming to increase physical activity or to both reduce sedentary behaviours and increase physical activities.

Tremblay and Willms (2003) also cited substantial evidence of a negative association between physical activity and BMI, and positive associations between TV watching and video game use and excessive eating and sedentary activities. Included was the study by Gortmaker et al. (1996) that reported that youth in the US who watched more than 5 hours of TV a day were 4.6 times more likely to be overweight than those who watched less than 2 hours a day. In a study of the determinants of physical activity in rural 5th grade children, Trost and colleagues (1996) found that TV watching was negatively associated with physical activity.

In their own study, Tremblay and Willms (2003) undertook an analysis of 1994 data on children 7-11 years old to examine the relationships among physical and sedentary activities and BMI. After controlling for SES and family background, they found that physical

activity (in the form of organized and unorganized sports or free-time activity) was negatively associated with overweight and obesity, while positive associations were found between sedentary activities (TV watching and video game playing) and overweight and obesity. Interestingly, these researchers also found that participation in unorganized sports and physical activities benefited children as they got older. In addition, attention was also drawn to the growing use of video and computer games and evidence of a negative relationship between video game playing and physical activity levels.

Berkey et al. (2000) conducted a longitudinal study that followed more than 10,000 9-14 year olds for one year. They found a larger increase in BMI for those children who spent more time watching TV and videos and playing video and computer games. For girls, decreased physical activity and increased caloric intake were also associated with increases in BMI. No associations were found for fat or fibre intakes and changes in BMI.

Consistent but relatively weak positive associations found by cross-sectional studies and mixed results of prospective studies led to a randomized controlled trial by Robinson (1999). This study conducted an experimental trial to assess the effects of reducing sedentary activities (TV, video tape and video game use) on adiposity, physical activity and dietary intake. Children in the intervention group had significantly lower BMI, as well as significant decreases in TV use and eating meals in front of the TV. No differences were found for high-fat food intake, moderate-vigorous physical activity or cardiorespiratory fitness.

Several studies also suggest that watching television may be a cue for eating and that food consumption in front of the TV is more likely to consist of high-fat, salt and sugar snacks or meals. Crespo et al. (2001) found that girls who watched five or more hours of TV daily consumed 175 calories more each day than those who watched television less than an hour a day. Another study of the impact of TV viewing on food consumption looked specifically at fruit and vegetable consumption and found that watching TV was negatively associated with intake of fruit and vegetables in adolescents (Boynton-Jarrett et al., 2003). This prospective study indicated that both TV viewing at baseline and the change in television viewing independently predicted decreases in fruit and vegetable consumption. A recent Canadian study by Marquis and colleagues (2005) found that more than 20% of French Canadian 10 year olds ate in front of the TV every day and more than 60% reported "often" eating while watching TV. Most often chips, sweetened foods and beverages and french fries were consumed. Few high fibre foods such as raw fruits and vegetables and whole wheat bread were included in their diets. Interestingly, frequency of eating while watching TV was positively correlated with requests to eat advertised foods.

Although the evidence for an association between overweight and obesity and sedentary activities involving the TV and computers is mounting, not all studies have found significant differences (eg., Kohl & Hobbs, 1998; Robinson et al.,1993; see also reviews by Berkey et al., 2000, and Steinbeck, 2001). Further, some studies indicate that children's TV watching is not associated with decreased physical activity, although time spent in front of the TV has been shown to predict obesity in children (Kohl & Hobbs, 1998).

Differences in target groups, methodology and analyses may explain some of the discrepancy between study findings. For example, the Robinson (1999) study uses a strong methodological approach and adequate sample sizes, but the findings may only be applicable to adolescent females in northern California. The explanation for a relationship between sedentary activity and overweight and obesity is most likely a complex combination of effects from high-fat, high-sugar intakes, reduced physical activity and lower metabolic rate for too much time (Kohl & Hobbs, 1998).

The Case for Integration – The Combined Effects of Healthy Eating and Physical Activity

No single lifestyle factor exists in isolation of many other behavioural, social and environmental factors that simultaneously influence what people eat, how physically active they are and how healthy they are. Thus, it would be unwise to think that a single factor, in this case, diet or physical activity can be wholly responsible for the current trends of rapid increase in overweight and obesity. Even isolating these two health determinants is likely inappropriately narrowing the search for causes in aid of treatment and prevention. However, many researchers suggest that these two are key players in the bigger picture. As the WHO states:

> Changes in the world food economy have contributed to shifting dietary patterns, for example, increased consumption of energy-dense diets high in fat, particularly saturated fat, and low in unrefined carbohydrates. These patterns are combined with a decline in energy expenditure that is associated with a sedentary lifestyle – motorized transport, labour-saving devices at home, the phasing out of physically demanding manual tasks in the workplace, and leisure time that is preponderantly devoted to physically undemanding pastimes (Joint WHO/FAO Expert Consultation, cited in Lobstein et al., 2004, p. 6).

Surprisingly, few of the studies reviewed for this paper included both diet and physical activity in their purview, although those that did emphasized the need to consider both sides of the "energy-balance equation" in concert with research on the etiology of childhood obesity (Birch & Fisher, 1998). These researchers lament the lack of research that has adopted "a conjoint focus on intake and expenditure," stating, "Thus we have little knowledge about how children's food intake and physical activity may interact to influence energy balance. Our knowledge also is limited by the lack of precision of the national databases on children's intake and the absence of a national database on children's physical activity" (p. 540). Dietz and Gortmaker (2001) in their overview of obesity prevention strategies for children and adolescents made an appeal for an integrated focus on both food intake and physical activity, commenting that changes in the balance of dietary intake and physical activity levels are two of the key mechanisms of the environmental effects on energy balance that have led to the current increases in childhood overweight and obesity.

In their review of the importance of both diet and physical activity to obesity prevention, Baranowski and colleagues (2000) pointed to the significant immediate and longer term

mental and physical health benefits to children in addressing both dietary and physical activity variables when investigating the determinants of obesity and developing interventions. The rationale was that because both diets high in calories and fat, and low levels of physical activity are associated with overweight, improvements in health should be evident if diets are improved and physical activity increased.

However, findings to date are inconsistent and difficult to interpret. None of the reviews or studies found definitive relationships among diet, physical activity and obesity. A study by Johnson-Downs et al. (1997) found a positive association between physical activity and dietary intake in 9-12 year olds. Total energy intake, calcium, iron, zinc and fibre intake increased as physical activity increased, but children's weight did not increase. Interestingly, despite a high prevalence of obesity in this sample of low income, multiethnic children, they ate a balanced diet. The study did not find an association between BMI and frequency of physical activity and therefore it was unlikely to have been a confounder. Because overweight children underreported their dietary intake, it was not possible to attribute overweight to either diet or physical activity.

Similarly, Muecke and colleagues (1992) reviewed studies that had evaluated the role of both diet and activity level in the same obese children. In the four studies they reported on, the findings were very inconsistent. One study found an association between food intake and obesity, another found an association between inactivity and obesity, a third found gender differences (dietary and environmental conditions for boys, and heredity and inactivity for girls) and the fourth found similar results for both diet and physical activity and concluded that obese children do not overeat.

In their comprehensive review of the available US data from several sources, Jeffery and Utter (2003) found no evidence for a relationship between either diet or physical activity and obesity. Descriptive data on temporal trends, cross-sectional and longitudinal studies, and experimental trials were included. It was concluded that there were no data that demonstrated the specific contribution of energy intake vs. energy expenditure. Nor did data exist that identified the contributions of specific behaviours related to diet and physical activity. In a similar vein, in justifying continued support for increased physical activity in light of the difficulty linking it directly to overweight and obesity, Styne (2005) suggested both that it is unrealistic to expect physical activity to counteract a poor diet, but more importantly, that "... many small changes, rather than one overall solution, will be needed if we are to change our aggregate march to higher BMI values" (p. 338).

Muecke et al. (1992) also conducted their own study, combining prevalence and case control methods. They investigated the relationships between high-fat foods, low levels of physical activity and obesity, and found that neither high-fat intake nor low physical activity were independently associated with obesity. However, when they compared children with both exposures to children with neither, a 38% higher risk of obesity was found. They qualified their results (due to small cell sizes) but concluded that this finding was important as it might represent a "possible synergistic effect" and underscored the complexity and

likely multifactorial nature of obesity. This is certainly an accurate reflection of the challenges involved in identifying methods to effectively assess the potential impacts of a constellation of behaviours on overweight and obesity. The conclusions of Muecke and colleagues also reinforce the complex nature of obesity and its remedies.

2.5 Self-Efficacy and Health Locus of Control – Influences on Healthy Eating and Physical Activity

Individual capacity and perceived control are factors that affect many aspects of children's and adults' lives, and they are rooted in childhood experiences and environments. "Psychological characteristics such as personal competence and sense of control and mastery over one's life play an important role in supporting mental and physical health" (Health Canada, 1999, p. 9).

Although there are several important behavioural theories and constructs that have been suggested to mediate health status and its determinants, two – self-efficacy and multidimensional health locus of control were chosen because of their importance to the study's research questions and their combined potential for elucidating the relative importance of internal and external mediators of health, healthy eating and physical activity in children.

Self-Efficacy

Social cognitive theory (SCT) was developed by Albert Bandura (1986) in an attempt to explain and emphasize the cognitive component of social learning theory (Rotter, 1954, cited in Stone, 1998), in which SCT has its roots. The theory suggests that behaviour is uniquely determined by personal factors, environmental influences and the behaviour itself, all of which interact in a dynamic and reciprocal manner in which each may affect or be affected by either of the other two. It also contends that behaviour is controlled through cognitive processes and therefore behavioural responses are used antecedently to form expectations of outcomes. One of the core concepts of SCT is self-reflection – the ability to analyze experiences and alter one's thinking accordingly. Self-efficacy is one of the most important types of self-reflection. It is this concept that has become the central focus of Bandura's own research and that of many other researchers in fields including psychology, public health and health promotion.

According to SCT, people develop perceptions about their abilities that guide their behaviour. Self-efficacy reflects how people perceive their capability to perform a behaviour. These beliefs guide behaviour by determining what a person tries to achieve, how much effort is exerted, and how much the outcome is valued. Positive expectations from performing the behaviour must exceed negative expectations, that is, there must be a perceived benefit (Stone, 1998; US Department of Health and Human Services, 1996). Self-efficacy develops as a result of mastery experiences, vicarious experiences provided by others' successes and failures, social persuasion, and one's own stress reactions. As Bandura explained,

> Perceived self-efficacy is concerned with people's beliefs in their capabilities to exercise control over their own functioning and over events that affect their lives. Beliefs in personal efficacy affect life choices, level of motivation, quality of functioning, resilience to adversity and vulnerability to stress and depression. (Bandura, 1994, p. 81)

Self-efficacy (SE) is task and context specific, being related to specific behaviours and situations. More recently, Bandura has expanded the concept somewhat, explaining that it is a "multifaceted phenomenon" which requires clear definition of the domain, and good analysis of its facets, capabilities called upon and range of situations in which it will be used (Bandura, 1997). It is believed to be one of the most important factors in behaviour change, and has been widely used in public health to study a variety of health problems. A small number of studies have investigated the utility of self-efficacy as a correlate of physical activity or diet. However, very few of these have targeted children's dietary behaviours or physical activity levels, and even fewer have included both health factors. As with much of the research in this area, there are divergent findings.

Self-Efficacy and Healthy Eating

Specific studies have found differing results, suggesting that the explanatory power of self-efficacy related to diet may not yet be adequately understood. Parcel et al. (1995) found that SE was strongly associated with 3rd and 4th grade children's usual food choices, accounting for 34% of the variance. Corwin, Sargent, Rheaume, & Saunders (1999) found that several SCT variables, including self-efficacy (for low-fat foods) were significantly associated with 4th grade children's dietary behaviours. Other variables included social support for consuming fruits and vegetables, meal preparation involvement, and fruit and vegetable availability at home and school. Gender and race were also found to have significant associations. However, all significant variables explained only 11% of the variance in diet.

Resnicow et al. (1997) found bivariate correlations that several SCT variables, including food preferences, self-efficacy, food exposure, outcome expectations, and social norms were significantly associated with fruit and vegetable consumption in 7-11 year olds. However, in multivariate analysis, only two variables remained significant – fruit and vegetable preferences and positive outcome expectations, and together, they accounted for 10% of the variance in fruit and vegetable intake. These researchers suggested that SE may not be predictive of children's diet, given the complexity of the behaviour and the fact that children's dietary habits are often constrained by external factors, over which they may have minimal control. Thus, high SE to eat certain foods (e.g., fruits and vegetables) may have little impact on what children actually eat if these foods are not available or accessible. They also commented that the low levels of fruit and vegetable consumption may have made it difficult to detect effects. Given the current low levels of eating healthy foods, many studies may suffer from this limitation.

Domel et al. (1996) administered a SE questionnaire for fruit and vegetable consumption to 4th and 5th grade children and found that preferences were the only significant predictors, and that they accounted for less than 13% of the variance. These researchers also commented on the potential impact of overall low consumption rates and acknowledged that the behaviour is not completely under children's control, and thus may minimize the potential effect of perceived self-efficacy.

In a comprehensive review of the psychosocial correlates of fruit, juice and vegetables, (FJY), and fat consumption, Baranowski, Cullen & Baranowski (1999) found that overall, studies that used psychosocial variables (not just SCT variables) to predict dietary behaviours had low predictiveness, and even lower with children, where few model-testing studies exist. Baranowski and colleagues confirmed the lack of consensus among the few SCT studies on children and the possibility that environmental influences are as important as psychosocial factors for children.

Self-Efficacy and Physical Activity

As discussed earlier, a comprehensive review of psychosocial correlates of physical activity by Sallis et al. (2000) found inconsistent associations with self-efficacy. Of the studies that included 4-12 year old children, four found that self-efficacy was related to physical activity and four found that it was not. These results are contrasted to the findings of the Surgeon General's 1996 Report on Physical Activity (US Department of Health and Human Services, 1996), which found self-efficacy to be one of several of the most consistent modifiable correlates of physical activity.

Trost et al. (1996) found significant differences between girls and boys related to self-efficacy and physical activity. These researchers investigated several physiologic, psychosocial and environmental determinants of physical activity with respect to gender differences. Only self-efficacy for overcoming barriers and participation in community sports accounted for gender differences in both vigorous and moderately vigorous physical activity. This finding suggests that boys were more physically active than girls because they were more confident in their ability to overcome barriers such as time constraints, being tired, poor weather and homework demands. As with the diet studies, the significant variables accounted for only a small amount of variation. Further studies by the same group of researchers (Pate et al., 1997; Trost et al., 1997, cited in Welk, 1999) confirmed that self-efficacy for overcoming barriers was important for both boys and girls, although the barriers were different.

Saunders et al. (1997) undertook the development of three questionnaires to measure psychosocial influences on 5th grade students. The theory of reasoned action and social cognitive theory provided the theoretical bases. Data analysis from the development sample, but not the validation sample found that the self-efficacy barriers scale was correlated with both intention to be physically active and physical activity, while two other self-efficacy scales (support-seeking and positive alternatives) were correlated with only intention in both samples. Similar to the findings in other studies, the correlations were

significant but low. Strauss, Rodzilsky, Burack, & Colin (2001) also found positive correlations between self-efficacy and physical activity, though only with high levels.

In a study of the relationship of several social learning variables to physical activity, Stucky-Ropp and DiLorenzo (1993) interviewed 242 5th and 6th grade students and their mothers. The most important predictors were child's enjoyment of physical activity, and family social support (rewards and punishments). Self-efficacy did not emerge as an important predictor of physical activity. These findings point to the need to combine self-efficacy with an understanding of outside influences in children's lives, as suggested by the diet self-efficacy studies.

Multidimensional Health Locus of Control

In 1976, researchers in the US developed a health locus of control construct (Wallston, Wallston & DeVellis, 1978) that was derived from Rotter's Social Learning Theory. Rotter's theory included a generalized locus of control construct consisting of an internal/external rating scale. The construct that Wallston and colleagues developed has gone through several revisions, first becoming the multidimensional health locus of control (MHLC), and more recently, "perceived control of health" (Wallston, 1992).

Multidimensional health locus of control is defined as the extent to which individuals believe that their health is controlled by internal (within one's own control) or external (outside of one's control, residing with other people, termed "powerful others") factors. The multidimensional aspect of the construct refers to its early expansion to include fate or chance as a dimension separate from external "powerful others." The MHLC construct is now measured using 3 six-item Likert scales – Internal HLC, Powerful Others HLC and Chance HLC.

MHLC has been used predominantly to study health and sick-role behaviours and to evaluate the effectiveness of health education programs (Brown, 1999; Thompson, Butcher & Berenson, 1987; Wallston, 1992). Because the MHLC scales were developed for use with adults, Parcel and Meyer (1978, cited in Thompson et al., 1987) initiated development of the Children's Health Locus of Control (CHLC) Scales. Problems of spurious high interitem correlations and questions of reliability due to the use of a dichotomous response format led Thompson and colleagues (1987, 1988) to investigate the use of the MHLC Scale with children. The objective was to determine whether the scale could be generalized across age groups in order to facilitate its use with both children and adults. Therefore, minimal changes were made to the scale (Form A) (Wallston et al., 1978), primarily by simplifying sentence structure, and using four-point Likert scales instead of the MHLC's six-point scales. The researchers wanted to know if this revised measure yielded reliable data, whether the factor structure would correspond with the three factor structure of the MHLC Scale (internal, powerful others and chance), whether scale score relationships would be comparable to previous findings, and whether children's scores would become more internal with age. They hypothesized that children's locus of control should become more internal as they age, reflecting the changing balance between internal control and parental

control as children get older. The study included Grade 4-6 students from an urban school district in the southern US.

Test-retest reliability coefficients for the three subscales and their total ranged from .62-.80. The researchers felt that these were reasonable given the brevity of the subscales, the findings of other relevant studies, and the fact that data on children tend produce low reliability. Factor analysis strongly supported the construct validity of the instrument, although the three factors accounted for only 1/3 of the item variance, not unusual in this field. Interscale correlation coefficients for the revised instrument supported the comparability to other studies that had used the MHLC Scale, and statistically significant differences between increasing age and increasing internal control, suggesting developmental trends affect internal locus of control. Thus the instrument was found to be reliable, valid and sensitive to developmental changes in children, and appropriate to be used with school-age children.

Few studies were identified that have used this revised instrument with children. Wilson, Williams, Arheart, Bryant & Alpert (1994) used it in a study that examined the effects of race, gender, and health locus of control on cardiovascular reactivity in 10-18 year old children and found that race and gender differences were associated with the Powerful Others subscale and the Internal subscale. Eiser, Eiser, Gammage, & Morgan (1989) investigated relationships between age, smoking, health locus of control, concern with consequences, and beliefs in the efficacy for staying healthy. The focus was on smoking in 11-16 year olds, and they found that of the three subscales, "chance" was predominant for smokers. Most recently, Malcarne, Drahota, & Hamilton (2005) found relationships between ethnicity, gender and family income and the revised MHLC Scale in children and adolescents. Stronger chance beliefs were found for Latino and African American children than Caucasian children, and Caucasian children had less belief in powerful others than African American children. Differences were also found among children from higher-income families. Thus it was suggested that race and income may be important determinants of children's health locus of control beliefs.

2.6 Summary

The review of the literature that is relevant to this research provides important context and information about childhood overweight and obesity, the impact on health status, and potential relationships among health behaviours and psychosocial correlates. Though this field is relatively young, concerns about escalating trends in weight gain and related health-compromising conditions are justified.

Recent national surveys are beginning to provide new and more accurate information that will lead to better tracking of health status and trends in overweight and obesity, but regional data are also required to assist in determining local trends of prevalence of weight gain and related illness indicators. The epidemiological literature points to this need.

Important relationships among health, healthy eating, physical activity and overweight are identified in the literature, however, the predominant finding is the lack of consistency among them. This study aims to clarify some of these relationships.

3. METHOD

3.1 Community Characteristics and Target Group Descriptors

Community Characteristics

The research was conducted with Grades 4 and 5 students from four schools in the Northumberland region of the Kawartha Pine Ridge District School Board (KPRDSB). This is a large, predominantly rural school board in south central Ontario, with a small number of medium and small urban centres, including Peterborough, Bowmanville, Newcastle, Cobourg, and Port Hope. The Board services a large and quite diverse population of just over 37,000 students in 82 elementary schools,15 high schools and 4 adult learning centres. Two thirds of the Board's students are in elementary school. Gathering information about target group differences based on school location was an important consideration for the research design.

The schools included in the study sample were located in Northumberland County, within the jurisdiction of the Haliburton, Kawartha, Pine Ridge District Health Unit (HKPR). The Health Unit provides health services and programs to Northumberland and Haliburton Counties and the City of Kawartha Lakes. Eighteen percent (almost 30,000) of the population in these three areas is under 16 years of age, and another 7% is between 15 and 19 years old (Statistics Canada, 2001). With children and youth comprising slightly more than ¼ of the area's population, a focus on their health and well being is an appropriate and important priority.

Education, Employment and Socioeconomic Status

Within the Health Unit's jurisdiction, 17% of the population aged 20-34 has not graduated from high school, and 23% of those between the ages 35 and 64 do not have a high school graduation certificate. The labour force participation rate is 60%, noticeably lower than that of the province (67.3%), yet the unemployment rate, at 5.2%, is lower than the provincial rate of 7.0%. Average annual earnings of all people with earnings is ~$29,000, somewhat above the provincial average of ~$25,000. However, almost 16% of earnings are from government transfers (e.g., CPP, unemployment insurance) (Statistics Canada, 2005).

Of the 48,375 families in the Health Unit area, about half have children living at home (Statistics Canada, 2001). Twelve percent of children under the age of 18 live in low-income economic families and 11% of families are lone-parent families, the majority of which are headed by females. Lone-parent families have a median income of $30,659, compared to $55,190 for couple families (Statistics Canada, 2005). Both income levels are below the provincial averages of $33,724 for lone-parent families and $66,476 for couple families. Very small numbers of people with Aboriginal or visible minority backgrounds (just over 1% and 1% respectively) live in the area (Statistics Canada, 2001).

Statistics Canada uses LICO (low-income cutoff) rates to define poverty levels in Canada. Families living below this income level are typically putting most of their financial resources

into the basic costs of living such as food, shelter and clothing and have little left over for dental care, medicine, healthy food options, or recreation.

The LICO rate for a couple family with two children in the HKPR district is an estimated $24,000 and $21,000 for a lone-parent family with the same number of children (Statistics Canada, 1999, cited in HKPR, 2003a). Using LICO rates, the median income of all low-income families in the district in 2000 was $14,450, significantly below the LICO rate. Interestingly, low-income couple families had lower incomes ($13,550) than lone-parent families ($15,850). Overall, 19% of families with children had incomes below the LICO rate, while 38% of lone-parent families had incomes below the poverty line, compared to 18% of couple families (Statistics Canada, 2000, cited in HKPR, 2003a).

Forty-three percent of food bank recipients (425 for every 1,000) in Ontario are children (CICH, 2001) and lone-parent families are most likely to both experience food insecurity and be on social assistance (CCSD, 2002, cited in HKPR, 2003a). Almost 20% of families in the HKPR region live at or below the poverty line, and include working families earning minimum wage as well as those on social assistance (HKPR, 2003a). In 2003, 10% of adults surveyed reported that because of lack of money, they worried about not having enough to eat or did not have enough to eat or did not eat the preferred quality of food. Of this group, 30% did not have a place to go to access food (HKPR, 2003b).

Health Status Descriptors

More than half (58%) the HKPR's population aged 12 and older rate their health to be excellent or very good, and only 12% report fair or poor health (Statistics Canada, 2005). However, the population rates of several health status indicators would suggest otherwise. For example, using the standard BMI scores, almost 42% of people aged 18 and older in the HKPR district are overweight and another 19 % are obese (Statistics Canada, 2005).

Prevalence of other health determinants for the HKPR population aged 12 and older include:

- 34% started smoking before the age of 15;
- 18% smoke daily;
- 16% of non-smokers are exposed to smoke at home;
- 25% drink 5+ drinks on one occasion at least 12 times a year;
- 23% experience quite a lot of stress (for 18+ year olds);
- 45% are inactive in leisure time and another 23% are moderately active; and
- 55% consume fruits and vegetables less than 5 times per day (Statistics Canada, 2005).

There was someone who smokes in the home in almost half of the households surveyed by the Health Unit in 2002 (HKPR, 2003a). Second hand smoke is a risk factor for the development of asthma or other respiratory conditions in children. Over half the adults

surveyed reported that their oral health was excellent or very good, although 29% indicated that it had been more than a year since their last visit to a dentist (HKPR, 2002a).

When asked about the importance of nutrition when eating out, 60% of adults considered it very important. On average, adults eat out or ordered fast food about twice a week (HKPR, 2002b). Regarding physical activity, 30% of adults have been inactive in the past year (HKPR, 2003c).

Thus the health status context for this study involves a population that sees itself as being very healthy, yet the majority are overweight or obese, a notable percentage smoke and drink somewhat excessively and experience a high level of stress. Furthermore, almost half the population over 12 years old is physically inactive, and more than half have low consumption rates of fruits and vegetables or frequently eat out or order fast food.

3.2 Participant Selection and Sampling Recruitment

Board Approval and University Ethics Review

To obtain permission to conduct research that collected data from students in the Kawartha Pine Ridge District School Board, a research application was submitted and approved by the Board's Research Committee. The application included an explanation of the research rationale, research questions, target population, methodology, data analysis, expected results and communications plan. Examples of research instruments and informed consent forms were also required. Once approval of the research application was received, principals of potential participant schools were contacted to explain the research and request their participation. Preliminary meetings took place with four principals all of whom agreed to the involvement of their schools.

Similarly, the proposed research had to be approved by the Research Ethics Board of Lakehead University, through the submission of the Researcher's Agreement Form.

Students

The study sample consisted of 8 classes of students – one from each of Grades 4 and 5 in four schools in the southern area of the Board. Schools were selected on the basis of geographic location, accessibility, and likelihood of willingness to participate. Two schools were selected from the town of Cobourg to represent urban locations and two rural schools were selected from the Township of Hamilton, located just to the north of the town. Sampling from urban and rural schools was intended to provide information on differences related to important local variables that might differentiate health status and behaviours. The principals of each school, in consultation with his/her teachers selected the classes to participate. All students in these classes were requested to participate. Participation was based on a signed consent form for both or either of questionnaire completion and actual height and weight measurements.

Teachers

Teachers from the study schools were included to provide information on their perceptions of their students' health and related behaviours. A sample of teachers was obtained using convenience sampling and consisted of: 1) the teachers of the classes included in the study; and 2) other teachers in each school who voluntarily completed a teacher's questionnaire.

Parents

Parents in the study schools were included as another target group. Recognizing the importance of the role parents play in decisions about the health, nutrition and physical activity levels of their children, input from parents added a perspective to the study that was important to exploring children's perceived control and decision making. Parents' views on children's nutrition, eating habits and physical activity levels were obtained through qualitative focus groups.

The School (Parent) Council chairperson of each school was contacted with a request for assistance in identifying parents to participate in a focus group. Parent volunteers could be Council members or any parent who had a child in the school, regardless of grade. It was anticipated that at least one focus group of ~7 parents would be conducted at each school. Unfortunately, only one school was able to comply with this request.

3.3 Instrument Development

The study methodology combined survey research, two physical measurements- height and weight, and qualitative focus groups. Two questionnaires were developed for the study – a student questionnaire and a teacher questionnaire. A focus group guide was also created. The questionnaires and guide are found in Appendix 1.

Student Questionnaire

The student questionnaire items addressed to the first research question included demographics (e.g., age, grade, gender, and socioeconomic variables); health status (overall health, frequency of illness and symptoms, smoking in household and oral health,); nutrition (food types consumed; meals at home and out; frequency of regular meals); physical activity (types, amount, frequency, sedentary activities) and physical data (height and weight). Items related to psychosocial construct items (self-efficacy for nutrition and physical activity, and multidimensional health locus of control for nutrition and health) addressed the second research question.

Several existing questionnaires that dealt with children's health status, nutrition and physical activity were reviewed for relevance to the research. Items from four instruments that have been used in relevant research with the same age group were included in the study and a small number of original items were also developed. The four instruments from which items were selected included the Health Behaviour in School-aged Children Study (HBSC); the Children's Health and Illness Profile, Child Edition (CHIP-CE); a series of 3 questionnaires

developed to measure psychosocial influences on children's physical activity; and the revised Multidimensional Health Locus of Control Scale for children.

The Health Behaviour in School-aged Children Study (HBSC) is a World Health Organization (WHO) cross-national study in which Canada participates (Boyce, 2004; Currie et al., 2004; Janssen et al., 2004). The Canadian survey has been administered four times since 1989, with the most recent cycle taking place in 2000/01. Over 6,000 students in Grades 6, 8 and 10 have been surveyed each time. The HBSC provides comprehensive information about the health and well being of young people in Canada, and provided a pool of reliable, and valid items from which relevant ones could be replicated in this study. Items included in the student questionnaire were family affluence variables, and questions about nutrition and physical activity frequency and types.

The Children's Health and Illness Profile, Child Edition (CHIP-CE) is an assessment tool developed by researchers at the Johns Hopkins Bloomberg School of Public Health to measure children's perceptions of their health and well being (Johns Hopkins Bloomberg School of Public Health, 2004; Rebok et al., 2001; Starfield and Riley, 1998). It is based on a similar instrument, the CHIP-AE (Adolescent Edition) that was developed some years ago and has been extensively tested and used by the Johns Hopkins researchers (Riley et al., 1998a; Riley et al., 1998b; Starfield et al., 1996). The Child Edition instrument is designed for use with children between the ages of 6 and 11, and includes illustrations and multiple choice questions in five areas – well being, comfort, risk avoidance, resilience and achievement. Specific items dealing with demographics, health status, frequency of illness, eating habits, and physical activities were used from this instrument, although not in their original illustrated format.

Items from a questionnaire developed to measure psychosocial influences on children's physical activity were included to measure physical activity self-efficacy along three dimensions – support seeking, barriers and positive alternatives (Saunders et al., 1997). The actual wording of the items was slightly modified and five-point likert scales were used instead of dichotomous scales. An item related to intention to be physically active was also used from this research.

Three items from the Multidimensional Health Locus of Control Scale for children were used to measure health locus of control for overall health (Thompson et al., 1987). Original items were created for the following behaviours: smoking in household, dental care/oral health, nutrition self-efficacy and nutrition health locus of control.

Other instruments were investigated but not used. These included the HAES (Habitual Activity Estimation Scale) Scale, the CSAPPA (Children's Self-Perception of Adequacy in and Predilection for Physical Activity) Scale, the Participation Questionnaire (Klentrou, Hay & Plyley, 2003) and the Adolescent and Parent CHIP (Child Health and Illness Profile) instruments (Riley et al., 1998a; Riley et al., 1998b).

Teacher Questionnaire

The teacher questionnaire contained ten original items which asked about teachers' views of their students' health, eating habits and physical activity levels, and their perceptions of students' interest in having control over these behaviours. These items, developed specifically for the study, emerged from the research design and literature review. Likert scale and multiple choice formats were used. Space was provided after each question for teachers to explain or elaborate on their responses. This information was intended to expand upon the student survey data by providing teachers' perspectives on health, nutrition and physical activity of their students.

Parent Focus Group Guide

An interview outline was developed to guide the discussion during the focus groups. Included were discussion points about family nutrition and eating habits, family and children's physical activity levels and sedentary activities, and decision making and control among family members about what to eat and how to be active.

3.4 Data Collection

Student Survey

A meeting with each school's principal and the teachers whose classes were participating in the study was organized prior to conducting the research to review the study aims and procedures. Dates for administration of the research were also scheduled at this meeting. In some cases, more than one meeting was necessary.

At this meeting or shortly thereafter, parental/guardian informed consent forms were distributed to the teachers for their students to take home and return. Active consent was required from the parents/guardians of all students included in the study. Parents were asked to sign and return the form indicating whether or not they wished their child to participate in the study and permission to take height and weight measurements (see Appendix 1).

The timing of the research was determined by the teachers. It was suggested that the research activity could be integrated into a related learning activity to complement the curriculum and provide a learning opportunity for the students. All the teachers felt that it would be easier to schedule the research at a time when curriculum demands were less strenuous. In most cases, they felt that timing to coincide with a related learning activity was not necessary, as the research complemented the overall efforts in the classrooms and schools to promote healthy eating and physical activity. In fact, the teachers and principals of all four schools were very supportive of this research and made extra efforts to ensure that students returned their consent forms. Data collection took place over a 6-week period during February and March, 2005.

In all but one school, prior to beginning the research session, the students who were not participating in the study were located in an area of the classroom where they could continue with their schoolwork while the participants completed the questionnaire. The other

school requested that all students complete the questionnaire. This procedure had been used in other research projects in the school and it was felt that it was a good learning experience for everyone. The questionnaires of the students who did not have parental consent to participate were subsequently destroyed. Schools retained the returned consent forms.

Each data collection session began with a brief introduction to the study, and assurances that no individual student would be identified in any way, and that all responses would be held in confidence by the researcher. It was emphasized that the research was not a test, that there were no right or wrong answers, and that the students were being asked to choose answers that best described them, what they do and how they feel, not how they thought someone else would want them to respond. A demonstration on how to complete the questionnaire followed. The students were given instructions on how to mark and change answers, what to do if they did not understand a question, and then practiced answering sample questions. Students were asked not to work ahead, and to take the time to listen carefully to instructions and the reading of each question before answering. Each question was read aloud and then responded to. The delivery was paced to keep up with the slower students, and this led to some students working ahead even though repeatedly asked not to. In all classes, the teacher was present and most often assisted students (~2 per class) who had difficulty keeping up.

The administration of the questionnaire took about 45 minutes and upon completion, the children with permission had their height and weight taken. This was done individually in a separate location to ensure privacy and confidentiality. The time required to finish this component of the data gathering varied, depending on the number of students participating, but on average took about 20 minutes.

A wrap up with the students was offered to all classes, but often the researcher was requested to do this at a time when the findings of the study could be shared with the students. In the cases where a brief wrap-up took place, it included a discussion with the students about what research is and why it is important, and what the study was about. The next steps in the research process were outlined, and students provided their views on what research meant to them and topics they might like to research.

Teacher Survey

The teachers of the classes included in the study were given their questionnaires individually. Copies of the questionnaire were left with each school and the school administration requested that other teachers complete it. Completed questionnaires were picked up from each school by the study researcher.

Parent Focus Group

Contacts with School Council chairpersons took place either while in the school, or by phone. In the one focus group that took place, 5 parents participated. The group moderator (study researcher) introduced the study and its purpose and structure, and explained how

the information gathered would be used. Each participant was given an explanatory letter that included an informed consent form, which was signed and returned to the researcher. Agreement to tape the sessions was requested, and granted. A flexible interview guide was used that identified the areas to be covered, and open-ended questions were used to facilitate the discussion. The focus group was scheduled to take about an hour, and in this case, ran about an hour and a half, at the wishes of the participants.

4. DATA ANALYSIS AND RESULTS

4.1 Sample Characteristics and Response Rates

Student Survey

The total number of students available to complete the survey was 186, and of these, 132 completed questionnaires, a participation rate of 71%. Of those students who did not participate, 57% did not have signed parental permission and the remaining 43% were not at school the day the research was conducted.

Table 1. Response Rates of Student Survey

N		Survey Completions		Survey Completions with Measurements		No Informed Consent		Not at School	
#	%	#	%	#	%	#	%	#	%
186	100	132	71	127	68	31	17	23	12

Teacher Survey

Given the limited scope of the study, the teacher survey expected to collect data from a small number of teachers and the schools were asked to take on the task of distributing and collecting the questionnaires. The response rate of the teacher survey was very low, with only 12 completed questionnaires.

Parent Focus Group

As mentioned above, only one school was able to organize a focus group with parent volunteers, comprised of 5 mothers who had children in the school.

4.2 Data Analysis and Results

As detailed in Chapter 3 on Methods, the study sample was a self-selected group of Grade 4 and 5 children from four schools in the Kawartha Pine Ridge District School Board. The schools were chosen to represent urban and rural locations in the Board, and each school selected the classes. Frequency distributions, crosstabulations, chi-square analyses and regression analyses were used to analyze the data related to both research questions.

A. Demographics and Socioeconomic Status

Demographics

The demographic data included age in years, birth date, grade, geographic location, and information related to socioeconomic status (SES). Just over 54% of the sample was 10 years old (Table 2) and 61% of the children were in Grade 5. Girls represented 52% of the sample and boys 48%. Sixty-one percent of the children attended schools in a rural

location, approximately 15-20 minutes from the nearest town (population, 15,000). The urban schools were located in this town.

Table 2. Age in Years

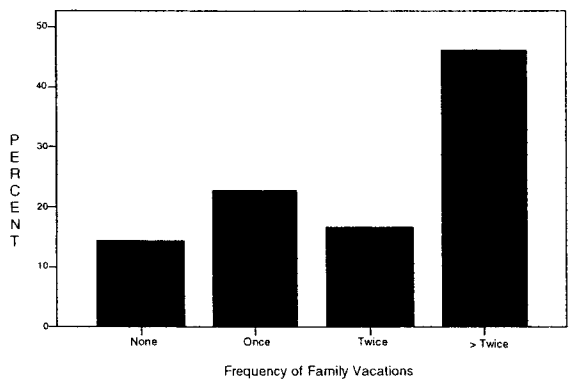
		Frequency	Percent	Cumulative Percent
Valid	9 years old	37	28.0	28.0
	10 years old	72	54.5	82.6
	11 years old	23	17.4	100.0
	Total	132	100.0	

Socioeconomic Indicators

Four variables related to material assets and disposable wealth from the HBSC survey (Boyce, 2004; Currie et al., 2004) were used to collect data related to socioeconomic status. In the HBSC survey, these variables were used as a proxy for family income, and a composite measure was created, termed the "family affluence scale" (FAS). They included: having your own bedroom; number of vehicles in the family; number of family vacations taken annually; and number of computers. Because income and perceived affluence data were not collected in this study, these variables were used as general indicators of socio-economic status (SES). A fifth variable, family structure (with whom the child lived) was also included to provide data on family stability and another indication of family income level.

A large majority of the children scored very positively on all the SES variables except one. Slightly more than half (63%) of the children's families took two or more vacations a year (Figure 1), while 81% had their own bedroom; 78% had more than one vehicle in the family; 100% of the group had at least one computer in the family and of these, 40% had two computers. Seventy-seven percent of the children lived with both their parents.

Figure 1. Frequency of Family Vacations per Year



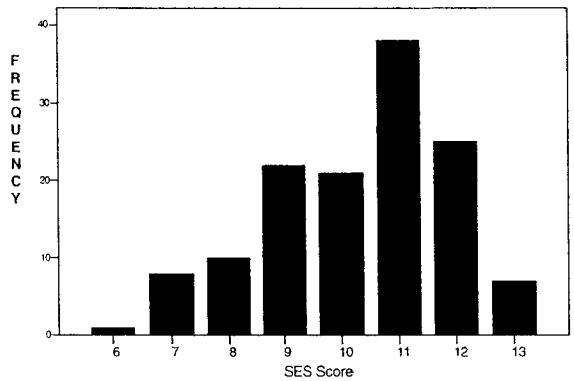
All the SES variables except the variable related to whom the children lived with were combined into an overall SES score. The response format for this question did not permit constructing a numerical scale to which positive and negative values could be assigned.

Therefore, it was analyzed separately, and grouped according to whether or not the children lived with both parents.

The SES score was constructed by summing the responses of Q. 5-8 of the questionnaire. For each question, a value of 1 indicated low socioeconomic status while a value of 3, 4 or 5 (depending on the range of response options) indicated high socioeconomic status. The potential range of scores for the variable was 4 to 13*.

The median SES score was 11, and the range of actual scores was 6-13, with 53% of the children with scores $\geq$ 11 and another 16% with a score of 10. Of the remainder, 46% had scores of 8 and 9, with only 8% scoring below 8 (Figure 2). The distribution of SES scores is positively skewed, indicating a relatively high overall level of economic stability for the majority of the children who participated in the study.

Figure 2. Overall Socioeconomic Status

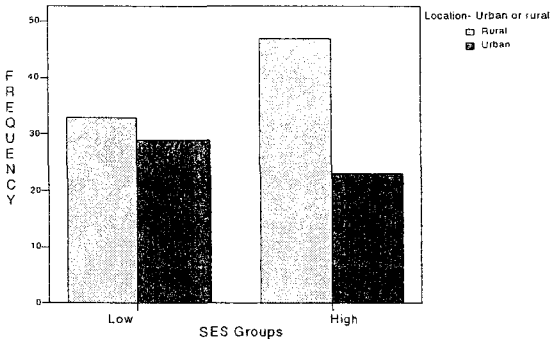


Possible relationships between SES and other demographic variables were investigated. No differences were found in overall socioeconomic status based on gender or age. Somewhat more of the children residing in an urban location had SES scores of 8 and below (21% vs.10%) and fewer children in this group scored 11 or above (44% vs. 59%), although these differences were not statistically significant.

When the SES score was split at the median (11) into high and low SES groups, it was again found that there were no significant differences based on age, grade or gender. As shown in Figure 3, more children from rural locations were in the high SES group, although this relationship was not significant.

* Actual ranges for each constructed score assumed responses to all items. In a few cases where an item was not responded to, the low end of the actual range was below the response range.

Figure 3. Socioeconomic Status and Geographic Location



Children who did not live with both parents were somewhat more likely to have a low SES score than children who did live with both parents. Although this relationship was not significant, the trend is worth noting. Sixty percent of children who did not live with both parents were in the low SES group, while 57% of the children who did live with both parents were in the high SES group (Table 3).

Table 3. Low and High Socioeconomic Status and Parents Lived With

SES Groups		Parents Lived With		Total
		One Parent*	Both Parents	
Low	#	18	44	62
	%	60.0%	43.1%	
	% of total sample	13.6%	33.3%	47.0%
High	#	12	58	70
	%	40.0%	56.9%	
	% of total sample	9.1%	43.9%	53.0%
Total	#	30	102	132
	%	22.7%	77.3%	100.0%

Gender Differences

There were no gender differences among the SES variables, and all but one of the demographic variables. Significantly more boys (70%) lived in a rural location while girls were more evenly located between the two locations with 52% living in a rural setting (Chi Sq.= 4.305, df=1, p=.038)**.

* Category includes all family structures except living with both natural parents.
** While an alpha level of p=0.05 was used to determine statistical significance, one may consider the more stringent Bonferroni correction (0.05/# of significant comparisons=21) of p=.002.

Table 4. Gender and Geographic Location

Gender		Geographic Location		
		Rural	Urban	Total
Female	#	36	33	69
	%	52.2%	47.8%	100.0%
	% of Total Sample	27.3%	25.0%	52.3%
Male	#	44	19	63
	%	69.8%	30.2%	100.0%
	% of Total Sample	33.3%	14.4%	47.7%
Total	#	80	52	132
	%	60.6%	39.4%	100.0%

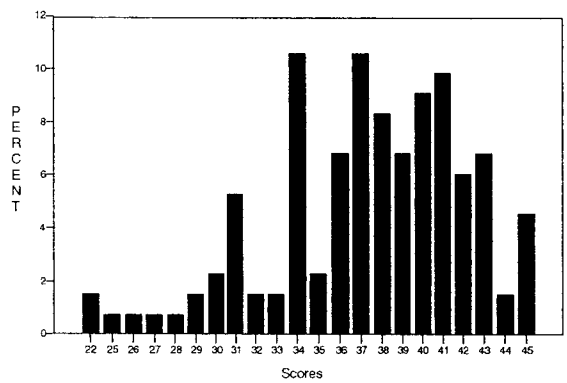
B. HEALTH STATUS AND DETERMINANTS

Health Status

The study's first research question investigated the health status of children aged 9-11, focusing on their eating habits and physical activity levels, and related determinants. This led to an investigation of self-reported health status, eating habits and physical activity levels of the study sample using frequency distributions and crosstabulations.

An overall health status score was constructed by summing the responses to Q.10-18 of the questionnaire. These were self-reported health questions. For each item, a value of 1 indicated poor health while a value of 5 indicated optimal health. The potential range of scores for this variable was 9-45, and the actual range was 22-45. Self-reported health status for this sample was quite high. More than a third had scores between 40 and 45, and another 35% scored between 35 and 39 (Figure 4).

Figure 4. Distribution of Overall Health Status Scores



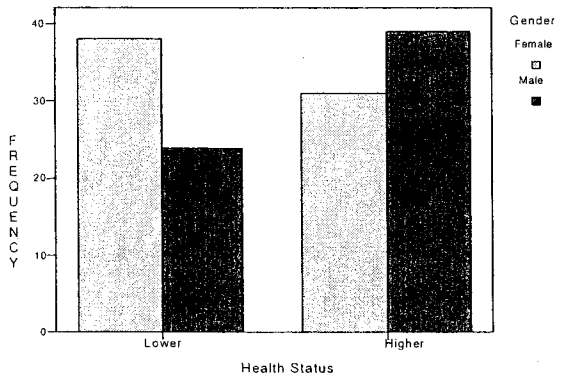
Using the median score (38), two categories of overall health were created to define good and poor health status. This grouping increased cell size, important with the small sample size of the study. Just more than half the children (53%) fell into the good health group. However, it should be noted that the low health status group overall included fairly high scores. In fact, when the distribution of the questionnaire item that asked specifically about

health status was examined, it was found that no one rated their health as poor, and only 4% of the sample responded that their health was fair.

Determinants of Health

Relationships between overall health and the demographic variables of age, gender, location and SES were investigated using crosstabulations and Chi-Square analysis. Only gender (Chi Sq.= 3.811, df=1, p=.051) was found to be significant. Girls were more likely to report lower health status than boys (Figure 5).

Figure 5. Overall Health Status and Gender



However, when the relationship between overall health status and gender and age was analyzed using an analysis of variance (ANOVA), no significant differences were found. However, a consistent trend was found for girls at all ages to report lower health status (fewer girls in "higher" health status group) and boys to report higher health status (Table 5).

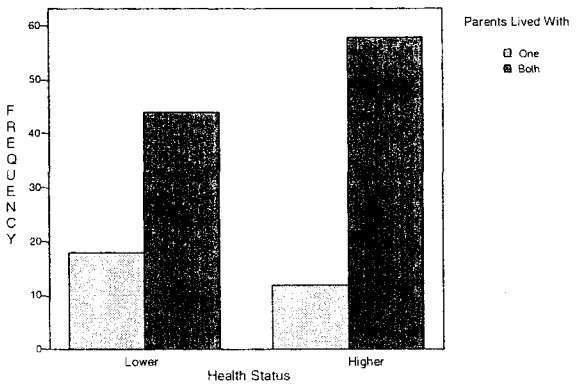
Table 5. Overall Health Status, Gender and Age

Gender	Age in Years	Health Status	#	%
Female	9	Lower	11	57.9
		Higher	8	42.1
	10	Lower	20	52.6
		Higher	18	47.4
	11	Lower	7	58.3
		Higher	5	41.7
Male	9	Lower	8	44.4
		Higher	10	55.6
	10	Lower	12	35.3
		Higher	22	64.7
	11	Lower	4	36.4
		Higher	7	63.6

The association between overall health status and whether or not children lived with both parents was not significant. However, children living with both parents more frequently reported better health (83%) than those who did not (71%, Figure 6). Although the p value a

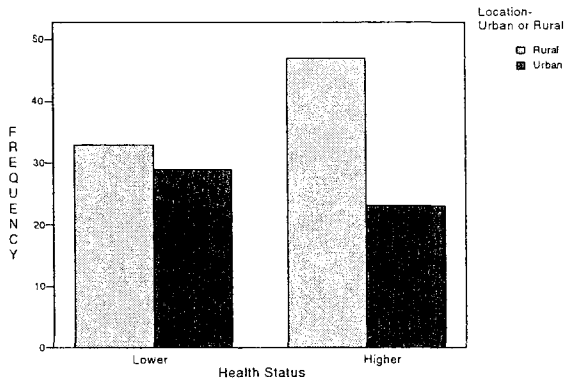
priori was established at the alpha level of $p \leq .05$, these data demonstrated a trend at $p = .1$. This trend was not found with the other SES variables.

Figure 6. Overall Health Status and Parents Lived With



Overall health status did not significantly differ with the geographic location of the two groups, however, there was a trend for more rural children to report better health status than urban children (Figure 7).

Figure 7. Overall Health Status and Geographic Location



Health Status and BMI

The BMI standards used in this study were the body mass index-for-age percentiles developed by the Centers for Disease Control (CDC) and used by the US, other countries, and until recently, the World Health Organization (WHO). These standards provide growth charts for girls and boys from ages 2-20. The 85th percentile BMI score differentiates between normal (and below) BMI and being at risk of overweight. The 95th percentile BMI score is used to identify children who are overweight.

This standard requires that children's BMI be determined for their gender and age. The sample size of the study precluded analysis at this level, as a result of unacceptably small cell sizes. Therefore only frequencies are reported (Table 6). Age and gender breakdowns are reported for each of three BMI-for-age percentile groups:

1) <85th percentile score (normal weight and below);

2) 85th percentile score to <95th percentile score (risk of overweight); and

3) ≥95th percentile score (overweight).

Table 6. Frequency Distributions of BMI-For-Age Percentiles by Gender and Age

BMI-for-age Percentile	GIRLS (#)			BOYS (#)		
	9 Years	10 Years	11 Years	9 Years	10 Years	11 Years
< 85th	11	22	9	12	24	8
85th- < 95th	5	10	2	4	5	0
≥ 95th	1	3	1	2	5	3
Total	17	35	12	18	34	11

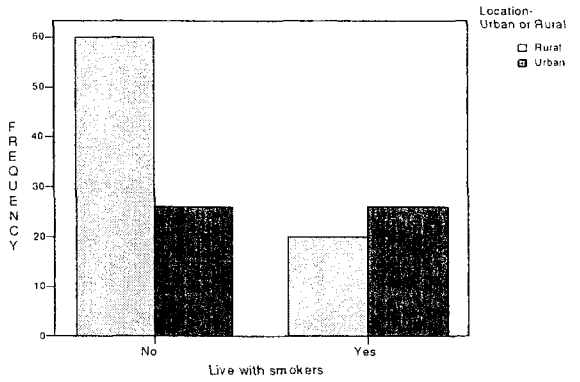
Based on the CDC growth charts for girls and boys ages 2-20, 34% of girls and 30% of boys who participated in the study were at risk of overweight or overweight for their age. For girls, 27% were at risk of overweight and 8% were overweight, and for boys, 14% and 16%, respectively were at risk of overweight and overweight. Of the three age groups, more 10 year-old girls than boys fell into these two categories. Height and weight measurements were not taken for 5 children, who did not have parental consent for them to be taken.

Although these data are helpful in understanding the prevalence of overweight and obesity in these children, the numbers were too small to be conclusive. When the relationship between BMI, age and gender was analyzed using an ANOVA, no differences were found in BMI measurements across age groups and gender.

Indicators of Health – Smoke Exposure and Dental Care

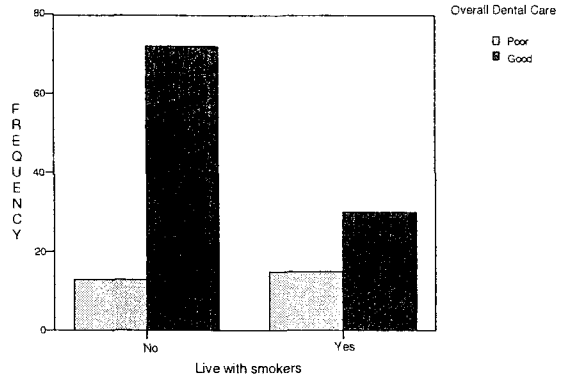
The majority of children (65%) did not live with anyone who smokes, and of the 35% who did, most (89%) lived with parents who smoke, while the remainder most often lived with a sibling or other family member who smokes as well as a parent. There were also no differences for this variable when relationships were investigated for age or gender. However, living with someone who smokes was significantly related to where the children lived (Chi Sq.=8.675, df=2, p=.003). Significantly more of the rural children did not live with anyone who smoked (Figure 8).

Figure 8. Children Who Do or Do Not Live with Smokers and Geographic Location



There was no significant difference in the overall health status of the children related to whether or not they lived with someone who smokes. However, as shown in Figure 9, living with someone who smokes was significantly related to dental care (Chi Sq.=5.666, df=1, p=.017). More children who did not live with smokers also reported overall good dental care practices.

Figure 9. Living with Smokers and Overall Dental Care



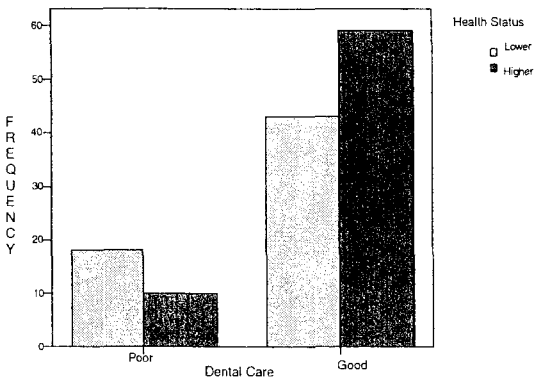
Questions on frequency of brushing teeth (dental hygiene) and visiting a dentist were included in the questionnaire. Almost all the children (95%) brush their teeth once a day or more, and of these, 75% brush more than once a day. Visits to the dentist are also frequent, with 87% going at least once a year and of these children, 59% going at least once every six months. However, there remain 13% of the children who do not get regular dental checkups.

An overall dental care score was constructed by summing the responses of Q. 20-21, the two dental care variables. A value of 1 indicated poor overall dental care while a value of 4 or 5 (depending on the question) indicated good dental care. The potential range of scores for the variable was 1-9, and the actual range was 3-9. The median score was 8, and the frequency distribution was extremely positively skewed, with 92% of the children scoring at 7 and above and 79% scoring at or above 8.

A poor/good dental score was constructed to use in crosstabulations with demographic and the individual health status variables. No differences were found for any of these variables, except "living with someone who smokes", as discussed above.

A significant difference was found in overall health status between children with poor and good dental care (Chi Sq.=4.320, df=1, p=.038). Children who reported good health, not surprisingly, also reported good dental care habits (Figure 10).

Figure 10. Dental Care and Overall Health Status



Healthy Eating

An overall score was created from the questionnaire items related to nutrition and eating habits. This score was constructed by summing the responses of Q. 22-26. A value of 1 indicated overall "unhealthy" eating while a value of 5, 7 or 8 (depending on the question) indicated overall healthy eating habits. The potential range of scores for the variable was 9-58, and the actual range was 11-55.

The median score was 41.5. The results indicated that about 1/3 of the children scored 45 or above, and 51% scored between 35 and 45. Overall the children reported healthy eating habits. Relationships between healthy eating, and demographic and other health status variables were also investigated. The median score was used to create two overall healthy eating groups – poor (unhealthy) and good (healthy) eating habits. There were no significant differences found based on age, gender, location, SES, or parents lived with.

Trends, although not statistically significant, were found for: 1) SES, with more of the high SES group in the good healthy eating group (59% vs. 47%); 2) "parents lived with," where more of the children who lived with both parents were in the good healthy eating group (83% vs. 71%); 3) geographic location, with more of the rural children in the good healthy eating group (68% vs. 53%); and 4) overall health status, with more of the healthy eating group reporting good health status (61% vs. 46%).

When two specific aspects of health behaviour – dental care and living with smokers, were investigated, strong relationships were found for both. Children who reported good dental care (Chi Sq.=4.552, df=1, p=.033) or living with non-smokers (Chi Sq.=10.811, df=1, p=.001) had better healthy eating habits (Figures 11 and 12).

Figure 11. Healthy Eating and Dental Care

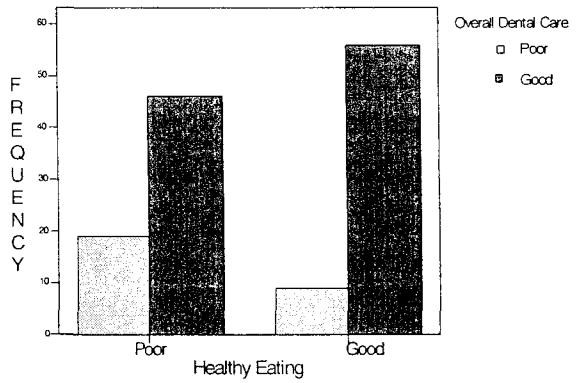
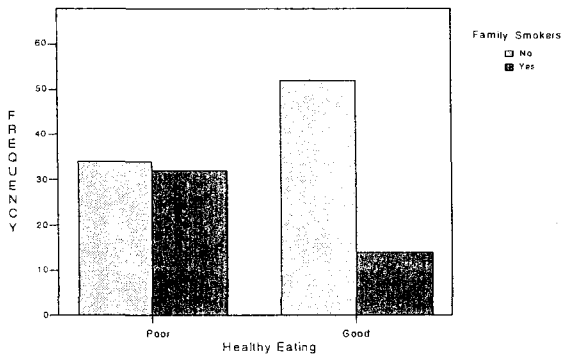


Figure 12. Healthy Eating and Family Smokers



When the distribution of responses to the individual items that were included in the overall healthy eating score were investigated, important differences were found. For example, the frequency of fresh fruit consumption was noticeably higher than either raw or cooked vegetable consumption. Sixty-six percent of the children reported eating fresh fruit at least 5-6 days/week, while 40% and 43% respectively, reported the same frequency of eating raw or cooked vegetables. Thirty percent of the children indicated that they ate sweets (candy or chocolate) at least 5-6 days per week, and 21% drank coke or other soft drinks containing sugar at least 5-6 days per week.

Almost everyone reported eating breakfast every day of the week – 75% ate breakfast every day and another 8% ate breakfast 6 days per week. On the other hand, 17% of the children missed eating breakfast at least twice each week. Similarly, while the majority of children ate meals with their parents almost every day or every day, 17% ate with their parents at most only some days each week, and 14% only ate three meals a day on some days each week. Eating out or having take-out or fast food was not a popular meal option, but 30% of the children reported that they did this at least some days each week.

Physical Activity

An overall physical activity score was constructed by summing the responses of Q. 27-33. A value of 1 indicated low overall physical activity levels while a value of 5, 7 or 8 (depending on the question) indicated high overall physical activity levels. The potential range of scores for the variable was 12-86. The actual range was 31-85 and the median was 61. The distribution was positively skewed. Twenty-two percent scored 70+ and another 28% scored between 60 and 70.

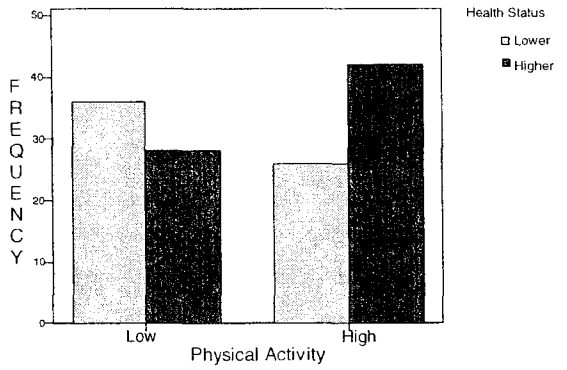
The overall physical activity score was used to split the sample at the median into high and low physically active groups. Chi-square analyses were performed and no statistically significant differences were found in self-reported physical activity levels based on age, gender, or location.

A trend, although not statistically significant, was found for overall socioeconomic status, as more children (60% vs. 45%) in the high physical activity group were also in the high SES

group. A strong relationship was found for the SES indicator of whom children lived with (Chi Sq.=5.138, df=1, p=.023). More physically active children lived with both parents than did children who reported low levels of physical activity.

When the relationship between physical activity level and health status was investigated, it was found that high physical activity levels and good overall health were significantly related (Chi Sq.=4.296, df=1, p=.038). As shown in Figure 13, physically active children more often reported that they were very healthy than did children who were not physically active. However, no differences were found between physical activity levels and either dental care or living with smokers.

Figure 13. Physical Activity and Overall Health Status



Frequency distributions of some of the individual items also provided important descriptors of the children's physical activity levels. Similar proportions of children engaged in competitive team or individual sports, 69% and 63% respectively. However, they differed substantially on the frequency of participating in organized physical activities and free time activities. Thirty-two percent participated in organized activities at least 2-4 days per week and of these, 18% participated in these types of activities 5-6 days per week. In contrast, 89% of the children reported participating in physical activities in their free time at least 2-4 days per week and 72% participated in free time physical activities at least 5-6 days per week. Levels of physical activity were not differentiated, but physical activity was defined and examples provided during the introduction to the physical activity questions and repeated several times during the reading of these questions. This definition described moderate to vigorous physical activity.

When the children were asked to indicate how many days each week they spend being physically active for more than 60 minutes each day, 62% responded that in a typical week, they did so on at least 5 days. At the same time, the children appeared to spend a significant amount of time in sedentary activities. Sixty-three percent reported watching TV or playing video games for about 2 hours a day. Other sedentary activities – computer games (24%), emailing (15%) and surfing the internet (15%), were engaged in much less frequently when the same time period (~2hrs) was compared.

When the relationship between physical activity and healthy eating was analyzed, it was found to be significant (Chi Sq.=4.368, df=1, p=.037). Overall, more children who had high physical activity levels also had good healthy eating habits.

C. SELF-EFFICACY AND HEALTH LOCUS OF CONTROL

The four psychosocial variables included in the study were intended to provide insight into children's beliefs about their capability to eat healthfully and be physically active (self-efficacy constructs), and their perceived control over specifically nutrition and their health in general (health locus of control constructs). The analysis of these constructs addressed the study's second research question, exploring what children's beliefs are and how they perceive their ability to control what they eat and how healthy they are.

Relationships between each of these variables and the demographic, healthy eating and physically active variables were investigated using frequency distributions and Chi-Square analyses. The predictive abilities of the psychosocial variables were examined through linear regression analyses.

Nutrition Self-Efficacy

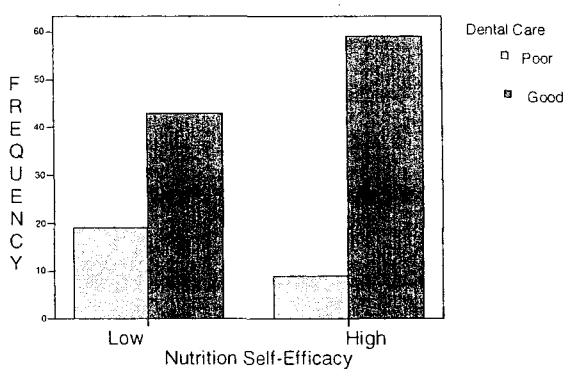
The two self-efficacy (SE) items that investigated nutrition self-efficacy were specifically related to consumption of fresh fruits and vegetables. These items also focused on children's ability to influence their family to help them eat more healthfully. A self-efficacy nutrition score was constructed by summing the responses these two subscales in Q. 34 – "I can ask my parents to buy more raw fruits and vegetables," and "I can tell my family that we should eat more fruits and vegetables." A value of 1 indicated a low SE score while a value of 5 indicated high SE. The potential range of scores was 5-10, and the actual range was 2-10 (<5 due to missing values), with a median score of 8. The results indicated that a majority of the children had confidence in their capability to eat healthy foods. Sixty-four percent of the sample scored at 7 or above.

Correlates of Nutrition Self-Efficacy

When the relationships between nutrition self-efficacy and the demographic and SES variables were analyzed, no significant differences were found except for geographic location (Chi Sq.=16.275, df=8, p=.039). Children who lived in rural areas were more confident in their capability to eat healthfully.

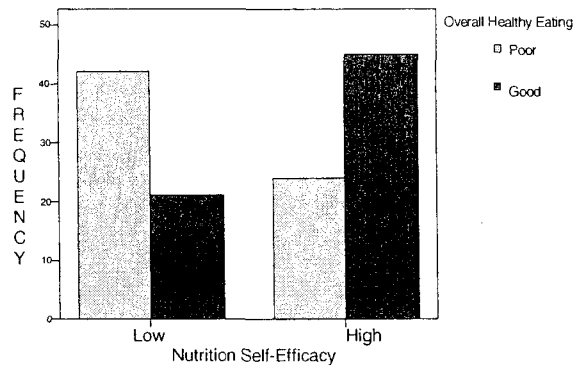
There was no significant relationship found between nutrition self-efficacy and overall health status. No difference was found for the "living with smokers" variable, but there was a relationship with overall dental care (Chi Sq.=5.817, df=1, p=.016). Children who reported being self-efficacious for nutrition also had good dental care habits (Figure 14).

Figure 14. Nutrition Self-Efficacy and Dental Care



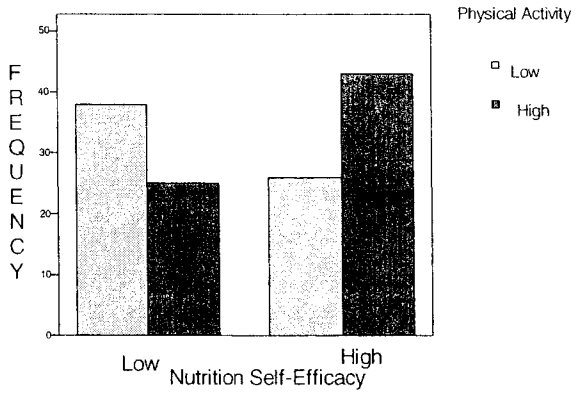
When the relationship between nutrition self-efficacy and overall healthy eating was investigated, it was found to be highly significant (Chi Sq.=13.391, df=1, p<.001, Figure 15). Children who saw themselves as being capable of eating healthfully, also reported eating healthfully more often than children who did not.

Figure 15. Nutrition Self-Efficacy and Healthy Eating



The relationship between nutrition self-efficacy and reported physical activity was also investigated. As shown in Figure 16, significantly more children in the high self-efficacy nutrition group were also in the high physical activity group (Chi Sq.=6.756, df=1, p=.009). However, no relationship was found between nutrition self-efficacy and intention to be physically active.

Figure 16. Nutrition Self-Efficacy and Physical Activity



Nutrition Multidimensional Health Locus of Control

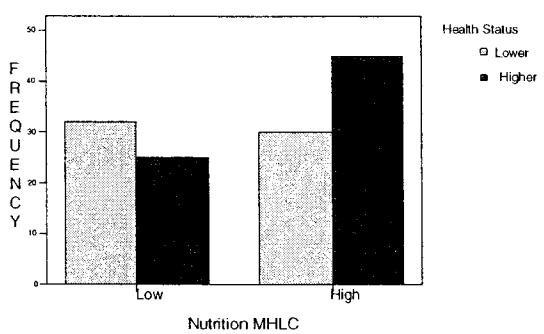
A multidimensional health locus of control score (MHLC) for nutrition was constructed by summing the responses on the 3 MHLC nutrition subscales in Q. 34. These items focused on eating "junk food" and fresh fruits and vegetables. A value of 1 indicated low MHLC while a value of 5 indicated high MHLC. The potential range of scores for the variable was 3-15, and the actual range was 2-15 (<3 due to missing values). The median score was 11 and again a majority of the children (70%) scored above 9. This suggests that, for the most part, children felt that they were able to control their consumption of junk food, and fresh fruit and vegetables. As with the nutrition self-efficacy items, these combined internal and parental support dimensions.

Correlates of Nutrition MHLC

Similar to the nutrition self-efficacy variable, no differences were found for relationships with any of the demographic or SES variables, although there was a trend for children from rural locations to more often report having control over what they eat than urban children (64% vs. 36%).

Although a statistically significant relationship between nutrition MHLC and overall health status was not found, an important trend was noted. Children who perceived that they had control over what they eat were more likely to also report good health (60% vs. 44%, Figure 17).

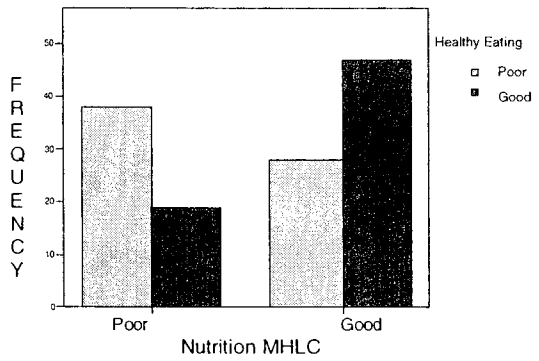
Figure 17. Nutrition MHLC and Overall Health Status

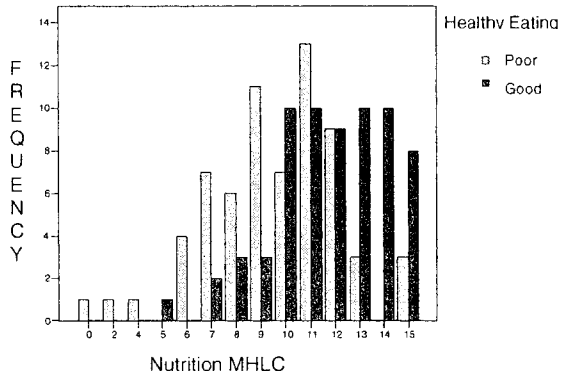


Unlike the relationship found between nutrition self-efficacy and dental care, no such relationship was found for the Nutrition MHLC variable and neither was a relationship found with the variable 'living with smokers'.

Nutrition MLHC and overall healthy eating were significantly related (Chi Sq.=11.147, df=1, p=.001). More children who perceived that they had control over what they ate reported healthy eating habits (Figure 18). The full range of nutrition MHLC scores for the two healthy eating groups is shown in Figure 19.

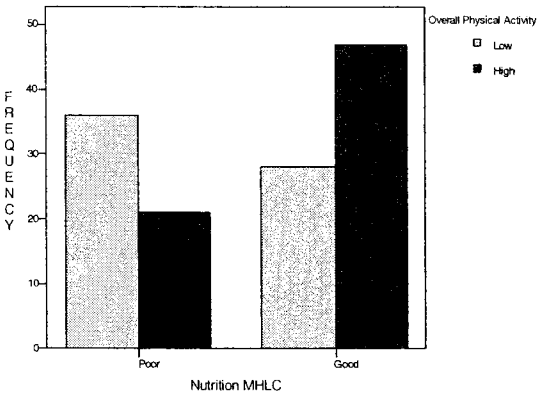
Figures 18 and 19. Nutrition MHLC and Healthy Eating – Grouped and Full Range of Scores





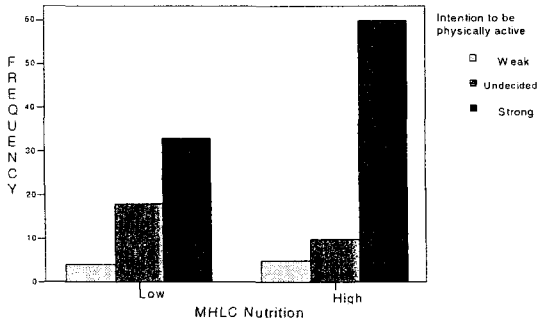
A significant relationship was also found between children's perceived control over what they eat and overall physical activity levels (Chi-Sq.=8.647, df=1, p=.003, Figure 20).

Figure 20. Nutrition MHLC and Overall Physical Activity



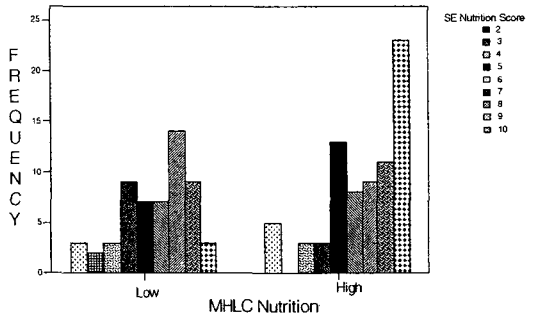
In contrast to the lack of relationship between children's nutrition self-efficacy and intention to by physically active, perceived control over what they eat was significantly related to intention to be physically active (Chi Sq.=7.332, df=2, p=.026, Figure 21).

Figure 21. Nutrition MHLC and Intention to be Physically Active



When the relationship between the two constructs related to healthy eating (nutrition MHLC and nutrition self-efficacy) was examined, the full range of scores suggested a trend for children who scored high on one, to also score high on the other (Figure 22). This difference was not found when the nutrition SE scores were split into two groups around the median, and the trend may be an artifact of clumping of the data. When the full range of scores for several of the variables was investigated, the data tended to clump or gather in some cells, at least partially due small sample size. This resulted in unacceptably small cell sizes, making a finding of significance difficult to interpret. In some cases, however, such as the one described here, these response patterns are important to be aware of. In other cases, it may be that a difference did not exist.

Figure 22. Nutrition MHLC and Nutrition Self-Efficacy



Physical Activity Self-Efficacy (SE)

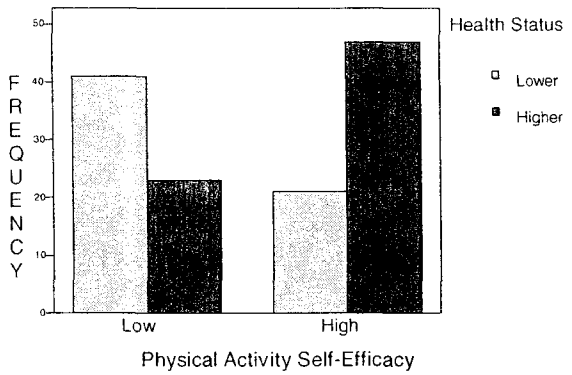
A self-efficacy score for physical activity was constructed by summing the responses of the 8 SE physical activity related subscales in Q. 34. For each item, a value of 1 indicated low SE while a value of 5 indicated high SE. The potential range of scores was 8-40; the actual range was 10-40 and the median was 35. Sixty-two percent of the children scored above 33 and another 18% scored between 30 and 33. Overall, the majority of children in this study both perceived themselves to be capable of physical activity and reported being very physically active.

Correlates of Physical Activity Self-Efficacy

No significant relationships were found between physical activity self-efficacy and any of the demographic or SES variables, nor with smokers in the family or dental care. However,

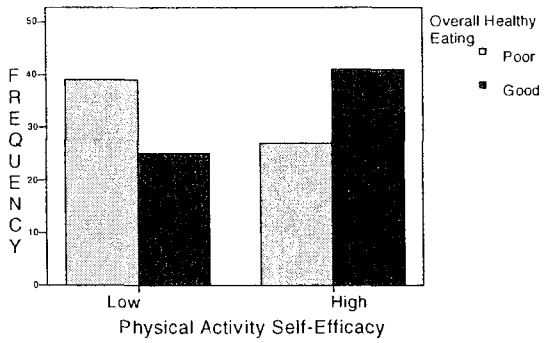
there was a very strong relationship between this variable and overall health status (Chi Sq.=14.572, df=1, p<.001), as shown in Figure 23.

Figure 23. Physical Activity Self-Efficacy and Overall Health Status



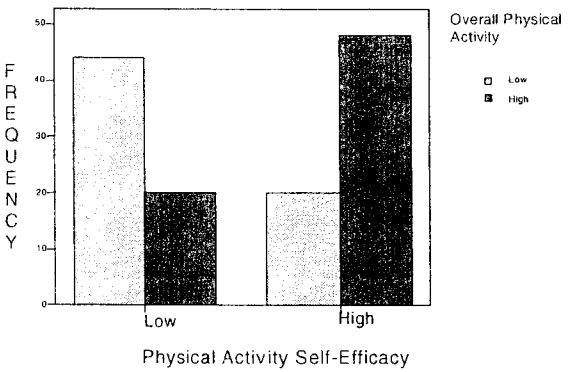
Self-efficacy for physical activity was also found to be significantly related to healthy eating (Chi Sq.=5.945, df=1, p=.015). Children who were confident in their ability to be physically active more often had good healthy eating habits than those who were not (Figure 24).

Figure 24. Physical Activity Self-Efficacy and Healthy Eating



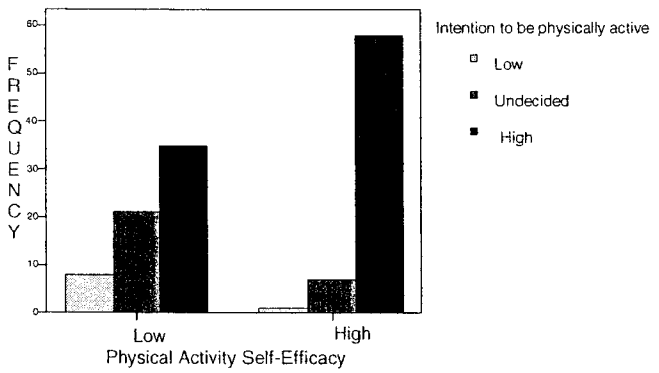
Self-efficacy for physical activity was also found to be strongly related to reported physical activity levels (Chi Sq.=20.427, df=1, p<.001, Figure 25). Children who demonstrated high self-efficacy or belief in their capability to be physically active were more likely to report being very physically active than children who were not confident in their physical activity abilities.

Figure 25. Self-Efficacy for Physical Activity and Physical Activity Levels



A trend was found for more children who were self-efficacious for physical activity to indicate that they intended to be physically active, however due to small cell size counts, it was not possible to determine the significance of this finding (Figure 26).

Figure 26. Self-Efficacy for Physical Activity and Intention to be Physically Active



Multidimensional Health Locus of Control for Health

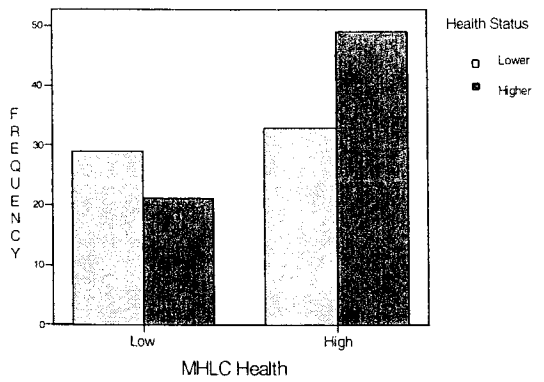
One set of items in the questionnaire gathered data on children's perceived control of their overall health. A multidimensional health locus of control score for overall health was constructed by summing the responses of the 3 MHLC health subscales in Q. 34. These were "I am in control of my own health," "The main thing that affects my health is what I do," and "My family has a lot to do with my becoming sick or staying healthy." For the first two items, a value of 1 indicated low MHLC while a value of 5 indicated high MHLC. The third item was scored in reverse. The potential range of scores for the variable was from 3-15, and the actual range was 0-15 (<3 due to missing values). The median score was 11. Twenty-nine percent of the sample scored above 11 and another 48% scored 10 or 11. A majority of the children felt that they had some control over their health.

Correlates of Health MHLC

There were no differences found between this variable and any of the demographic or SES variables. However, a significant relationship was found in overall reported health status for children who reported high vs. low perceived control over their health (Chi-Sq.=3.932, df=1,

p=.047, Figure 27). Interestingly, associations with the two specific health variables, dental care or living with smokers, were not found.

Figure 27. Health MHLC and Overall Health Status



No significant relationships were found between this construct and healthy eating or being physically active. Neither was there a significant relationship between this variable and intention to be physically active. MHLC for health was found to be significantly associated with only one of the other psychosocial constructs, that being self-efficacy for nutrition (Chi-Sq.=4.859, df=1, p=.027). Children who perceived themselves to have control over their health also reported that they were capable of eating nutritiously.

D. HEALTH BEHAVIOURS AND PSYCHOSOCIAL CONSTRUCTS AS PREDICTORS OF HEALTH

Linear regression analyses were used to measure the predictors of children's health, healthy eating and being physically active. In all cases, a backwards method was used to extract those variables that did not contribute to the predictive capabilities of the model.

A linear regression model was created to determine the extent to which healthy eating and physical activity contributed to overall health status. The overall healthy eating and physical activity scores were used and overall physical activity level was found to be a strong predictor of health status (p=.002) while healthy eating was not (Table 7).

Table 7. Physical Activity as a Predictor of Overall Health Status

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
2	(Constant)	30.685	2.188		14.023	.000
	Overall Physical Activity	.111	.036	.263	3.102	.002

Dependent Variable: Overall Health Status

When the variable "intention to be physically active" was added to this model, it was not found to be a predictor of health status.

A regression analysis was also carried out to investigate how much physical activity self-efficacy, nutrition self-efficacy and the nutrition health locus of control variables predicted

overall health status. Self-efficacy for physical activity was found to be a significant predictor of health status (p<.001), while the two nutrition scores were not (Table 8).

Table 8. Physical Activity Self-Efficacy, Nutrition Self-Efficacy and Nutrition Health Locus of Control as Predictors of Overall Health Status

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
3	(Constant)	28.746	2.353		12.218	.000
	Self-Efficacy Physical Activity Score	.257	.069	.310	3.713	.000

Dependent Variable: Overall Health Status

When the Health MHLC variable was added to this model, it was also not found to be a predictor of health status. Thus, of the four psychosocial constructs investigated, only physical activity self-efficacy was found to be predictive of overall health status.

E. INPUT FROM TEACHERS AND PARENTS

Input from teachers and parents was sought to contribute views and information from the adults who, to a great extent, influence and control important social and individual factors that determine the health of the children who participated in this study.

The data collected from teachers included responses to scaled questions, each of which requested additional open-ended explanation/elaboration. Thus the data are both quantitative and qualitative. As noted earlier, the sample of teachers was very small, and included teachers from Grades 1-8. The data is seen therefore, as providing an additional perspective to the study, but is not representative of teachers in general, or even teachers from the four study schools.

Similarly, the parent focus group data report qualitative information from one group of parents. However limited, this information is rich in its detail about what this group of parents thought about the healthy eating habits and physical activity levels of their children. Their views on important influences on their children's health, and the roles of parents, schools and teachers are invaluable. They are presented to assist in the important integration of information from all the key players in children's health – parents, teachers and schools, and, of course, the children themselves.

Teacher Survey Results – Teachers' Assessment of and Views on Student Health

Though this survey sample was very small, the findings are being reported to provide insight into teachers' views and concerns related to their students' health. It is important to keep in mind that these twelve teachers represent approximately 300 elementary school students, and over half teach the junior grades (4-6), a similar age range to that of the children who participated in this study. Representation was somewhat evenly distributed across the four study schools (4, 3, 3, and 2 returned questionnaires).

Students' Overall Health

More than half the teachers rated their students' health as average, and another ¼, as above average. None felt that student health was excellent, although at the time of the survey, almost none of the students were away from school due a significant illness (i.e., an illness serious enough to keep them home for more than two weeks).

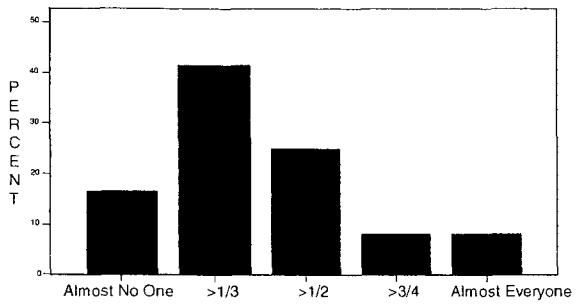
Additional comments, almost exclusively related to negative aspects of students' health status included:

- Decline in diet and general fitness level of students
- Regular absences due to illness with large classes
- Students being restless, tired and inattentive
- A lack of interest in exercise, sports, and healthy living
- The large role played by convenience and cost
- Not wearing appropriate safety gear such as bicycle helmets
- Living in smoke-filled environments
- High dental needs
- Regular consumption of highly processed foods such as lunchables, candy, fruit rollups
- Few children choose physical activity at recess or seem to enjoy physical education classes
- More computer games and less outdoor play [are predominant]

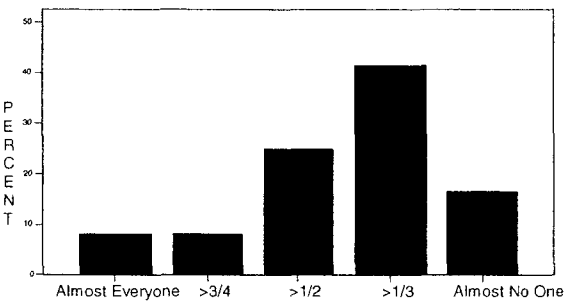
Healthy Eating and Physical Activity

Half the teachers reported that, at least twice a week, more than 30% of their students came to school without breakfast, and 83% of the teachers said that up to only half their students ate a healthy lunch at least three times a week. More than half the teachers also reported that between a third and half of their students were physically active at and outside of school, and the same proportion reported that more than half their students preferred sedentary activities (Figures 28 and 29).

Figures 28 and 29. Teachers' Perceptions of Students' Physical and Sedentary Activity Levels



Physical Activity Levels

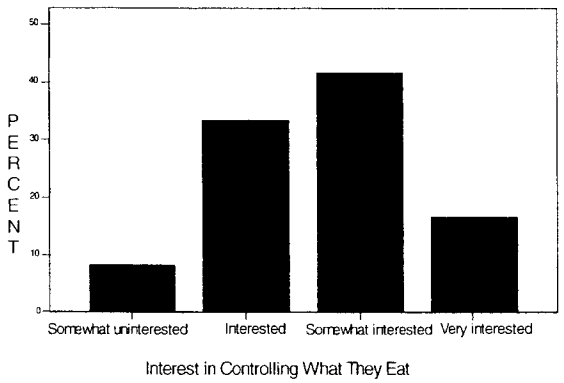


Sedentary Activity Levels

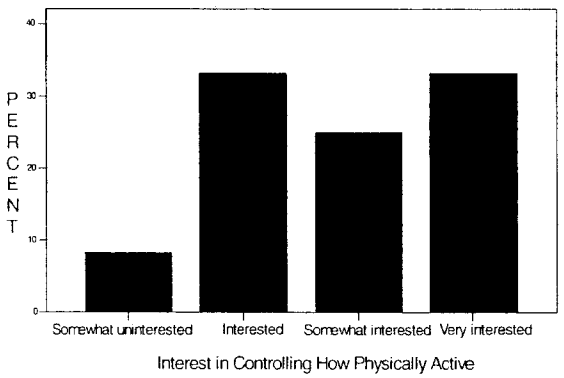
Perceived Control

Over half the teachers felt that their students were somewhat (42%) or very interested (16%) in having some control over what they eat, and another third felt that their students were interested. Similarly, just over half the teachers reported that their students were somewhat (25%) or very (33%) interested in having some control over how physically active they are, with another third being interested (Figures 30 and 31). When asked to assess their students' interest in being healthy, the majority felt that their students were somewhat interested (42%) or interested (33%)

Figures 30 and 31. Perceptions of Students' Interest in Controlling Nutrition and Physical Activity



Interest in Controlling What They Eat



Interest in Controlling How Physically Active

Explanatory comments included:

a) Students' Control Over What They Eat

Comments related to having control:

- Kids like to have their choice over what snacks they bring [to school].
- Students don't throw out much of their lunches and they talk to their parents if they don't like something.
- Students seem anxious to have more information about healthy eating.

Comments related to lack of control:

- At this age, they enjoy a good lunch and snack, but are quite happy to have parents prepare it for them.
- Students eat far too much candy, sugar, processed foods.
- Many children prefer packaged sweetened items.
- Students are given a lot of education about healthy eating and they demonstrate good food choices during breakfast program; they can also identify bad food choices during discussions and activities but eat these same bad foods when provided by parents in lunches.
- Most students' parents pack their lunches and the students don't give much thought to what they eat.

b) Students' Control Over How Physically Active They Are

Comments related to having control:

- Students look forward to phys ed classes and active recesses. They are, for the most part, eager to try out for school teams, participate in active clubs and are involved in activities after school.
- Students are interested in being active with activities they enjoy.
- Our students are very active.
- Children at this age prefer to be active, particularly if it has been modeled in their family lifestyles.

Comments related to lack of control:

- The majority of students are interested and enjoy physical activities in school, however their participation outside school is limited by parent involvement, the cost of organized sports, and the nature of the community.
- All express interest in physical activities but not all participate while on their own time.
- Students want to sit and do nothing, and they like to watch TV and play video games.

c) Students' Interest in Being Healthy

Comments related to being interested:

- Children seemed very interested with our health unit and eager to improve physical condition testing results.
- We do a lot of discussion about health and healthy snacks.
- Younger children do enjoy learning about their body and its functions.

Comments related to not being interested or qualified interest:

- They are interested but do not want to make the commitment for physical exercise. Also they lack the knowledge to make healthy food and life choices.
- We focus a lot on healthy eating and making healthy choices in the classroom, but due to their age, students are limited by their parents when it comes to most choices they can make on their own. Many parents have not shown a huge response to newsletter suggestions.
- Not a lot of follow-up at home.
- Students do not think or worry very much about their health.
- Students are interested but do not analyze their lunches, exercise and activities in relation to their health.

Perceptions of Parents' Attitudes about Children's Health

Teachers were also asked to indicate how important parents think their children's health is. About a third of the teachers felt that parents thought their children's health was very or somewhat important, but the majority felt that parents view their children's health as just important or somewhat unimportant. Written explanations included:

Comments related to positive views:

- Parents care about their children. Most have healthy lunches.
- Parents are very concerned with the health of their children. They started a breakfast club to ensure that all children were off to a great start each morning.

Comments related to negative or qualified views:

- The lunches (unhealthy) provided by many parents lead me to believe that health is not a huge issue.
- Nutrition education and money are lacking. Parents have other issues that overshadow children and their needs.
- Parents feel it is important, but are overwhelmed with their lives. They lack the time, education and motivation to do what is important for their child's health.
- Most parents do care about their child's health, but do not always have the time, money or knowledge to provide what they require to be healthy. Convenience often plays a big role in what the students receive.
- Parents genuinely love and care for their children but are not concerned in general about their diet or solid sleep habits. I see a lot of packaged, processed foods. Also, children are very busy with after school programs – too busy for some, leading to fatigue.

Other Comments

Teachers were asked to provide any additional comments they might have on students' health, eating habits, physical activity levels, their ability to control these behaviours and their confidence in succeeding. These responses provided further insights, in particular, into the challenges facing low-income families and the factors that affect children's health.

- Our school services a low-income housing complex. These people need an education! Health ed and phys ed [should be] very important in their lives. They eat far too much processed food. Junk food, chips and pop are NOT breakfast!
- The limited income of families is reflected in what students are eating. For example, when lunchables, pogos etc. go on sale, students will be eating them long after the sale. Students also say they have been told by their parents that they don't have the money for helmets etc. Many are single parents that are somewhat limited by what they can do with their time, resulting in less outdoor activities. Sadly, I feel that many of parents choose convenience over the dedication it can sometimes take to lead a healthy lifestyle and pass that onto their children.
- Parents need to be educated about healthy lunches. By Grade 5/6 students should be able to have some control over their snacks and should be made aware of Canada's Food Guide, i.e., how many servings of fruit and vegetables they should be eating each day.
- Students are often sleepy in class due to lack of sleep, proper bedtime, getting up at 5 or 6 so a parent can get to work, air quality in classrooms, and improper nutrition. We are seeing more ADHD (Attention Deficit Hyperactivity Disorder), PDD (Pervasive

Development Disorders) and ASD (Autism Spectrum Disorder). Emotional distress is high too. School nurses should be in our schools.

Focus Group Results – Parents' Views on Children's Health and Influencing Factors

The five participants of the focus group that took place were all mothers of children at one of the study schools. The grade levels of their children ranged from Grade 1 to Grade 6, one family also had a child in Grade 7 at the local junior high school, and all but one of the families had two children. Just over half the children were in Grades 3-5. This focus group represented a rural school community with primarily couple families and medium to high socioeconomic status. These parents were likely representative of the more prosperous and stable families in the study sample.

These women were articulate, introspective, knowledgeable parents who expressed a keen sense of responsibility and concern for the health of their children. A wide ranging and lively discussion took place over an hour and half during which all actively contributed stimulating and varied perspectives.

Nutrition and Family Eating Practices

All the families ate three meals a day and ate together as often as possible. Not every family could eat all their meals together due to parents' schedules, but all felt it was important for the family to be together at meal times whenever possible.

In-depth discussion took place about the eating habits of the children, providing several examples of how different these patterns can be, within, let alone among families. Often the two children in a family were described as having virtually opposite eating habits. One child was a very "picky" eater and the other was willing to eat everything. The range of being particular about food preferences included not liking meat, not liking condiments and spices, not liking vegetables, and changed preferences – "He has stopped eating everything he used to love."

Participants themselves were quite knowledgeable about healthy eating practices. They also reported that their children were quite knowledgeable and aware of the Canada Food Guide, although they did not always follow it. Whether or not these were the best guidelines to follow was debated. Some children didn't like candy, but most were likely to consume pop, ice cream and chips when given the opportunity, which was, for the most part, infrequent or rare. One family with a hyperactive child had adopted a diet exclusive of sugar and refined products, and at least two of the families attempted to eat organic products. All were conscious of the disadvantages of pre-packaged and processed foods, and most attempted to keep their diets free of them. However, parents also felt that healthy lunches often set their children apart and understood that children want to fit in. Ways to send healthy but "OK" lunches were discussed.

The cost of food and whether or not both parents worked were identified as key factors that influenced families' ability to eat healthfully. Having someone at home full time provided the time and resources required to prepare healthy homemade meals. Setting good role models

for healthy eating was seen as a priority. One parent commented that breakfast can be more difficult to manage, as she doesn't like eating as early as her children need to.

Establishing good eating habits early in life was felt to be very important and the role of the school in children's healthy eating was also discussed. All parents felt that the school had an important responsibility to offer healthy food options without trans fats, sugar or preservatives. They applauded the current efforts of the school to provide healthy lunches and snacks. The School Council participated in providing lunch days, and several parents suggested that, as Council members, they too had a responsibility to set a good example and provide healthy lunches, rather than meals like "hot dog" days. "It sends the wrong message to the kids if the parents support this [hot dog lunches]."

Physical Activity

Parents expressed concern that children do not get enough free time outdoor physical activity, and that often time on TV, computer and video games has to be curtailed by parents. In fact some of the parents had strict rules including no TV or video games after school, and several worked diligently to provide both physical and sedentary alternatives, such as walking the puppy, playing board games and reading. Living in a rural setting meant that some of these restrictions were easier to establish and maintain.

Some parents were also concerned that, even if their children did not have portable computer games such as gameboys, because they were allowed at school, their children often spent recesses watching others play these games rather than being physically active. It was felt that, in general, schools do not provide enough support to regular physical activity. However, parents were also very positive about their own school's efforts, mentioning the Kilometre Club, which all students participate in (running or walking the perimeter of the school yard regularly), Harrier races (cross-country running competitions with other schools), and skipping programs. They acknowledged that children can have very different preferences in types of physical activities they enjoy and that parents and teachers must be creative in finding ways to keep everyone active. Instances of termination of physical education classes for junior high and high school students were mentioned and concern expressed about this negative trend.

Views on Children's Control Over and Choices Related to Healthy Eating and Physical Activity

These parents felt it was important to have rules about what children could eat or that they had to be active each day, but most indicated that they gave their children choices within certain boundaries. For example, children could opt to play soccer or baseball, but not to do nothing or play computer games. Or children were allowed to choose what they wanted to eat, but were required to try a small amount of everything being served. Some of the children regularly went grocery shopping with their parents and were involved in checking product contents, having some input into food selection, and were involved in preparing healthy meals. Parents felt it was important for their children to learn about healthy, cost-effective ways to eat, and to understand the link between money and healthy eating.

Consistent application of rules was felt to be important, however, especially in families where parents work, some rules are hard to enforce all the time and compromises have to be made. One parent commented, "It doesn't seem like you should need rules for something you do every day, but all of us have rules, and you have to have different rules for different kids." Parents also mentioned that it was important for their children to "buy in" to healthy practices. "They should make choices and be responsible for some of those choices." It was also felt that children sometimes need to learn from the consequences of their actions – for example, a child who overindulged in eating in sugar-laden food at a birthday party and was subsequently sick, learned a valuable lesson.

Parents also agreed that healthy choices were often trade-offs. For example, processed cheese would not necessarily be a preferred food choice, but, if eaten infrequently, was seen as a better choice than chocolate bars. Overall, these parents seemed to be saying that children needed to be given some control over what they eat and what they do to be physically active, but that the parameters within which these choices take place are made by them. They all expressed a high level of responsibility for ensuring that their children are healthy.

5. DISCUSSION AND CONCLUSIONS

5.1 Findings

Environments and personal factors that support and enable healthy lifestyle choices can have positive effects on overall health. This study undertook to determine, on a pilot basis, the health status, and related healthy eating and physical activity behaviours of 9-11 year olds in large rural school district in Ontario, Canada. It also investigated the relationship of two psychosocial constructs (self-efficacy and multidimensional health locus of control) to health status and these two health behaviours.

Demographic and SES Indicators

Across the demographic variables, no gender or age differences were found with the exception that significantly more boys lived in rural locations. Interestingly, rural geographic location was positively associated with two variables – living with no smokers and nutrition self-efficacy and showed a trend towards a positive association with four other variables – SES, health status, healthy eating and multidimensional health locus of control for nutrition. This was the only demographic variable that was frequently found to be associated with SES, health and nutrition variables. It is noteworthy that no associations were found with physical activity or self-efficacy for physical activity variables.

Based on the variables chosen as socioeconomic indicators, this is not a significantly economically disadvantaged group of children. Further, SES did not vary with age or gender, and almost 80% of the children lived with both parents, another indicator of family income and security.

Health Status and Determinants

Overall Health

Reported health status was very high and overall, this sample of children was not a group that is compromised with respect to their health. Although it was somewhat unexpected to find no relationship between overall health status and socioeconomic status indicators, the group's predominantly good health and high SES status might preclude this. It should be noted that, relative to other studies in this field, this sample was unusual in both its good health and high socioeconomic status.

Gender did not play a key role for any of the variables in the study except health status, and no significant within-gender age differences were found, although older boys (10 and 11 year olds) tended to report better health. Girls were significantly more likely to report poor health than boys. This finding supports much of the research on gender differences in childhood and adolescent health. However, because no other gender differences were found, it is difficult to explain the reason for this.

Although not significant, a trend was found for children living with both parents to report better health, suggesting that factors related to family structure may influence children's health status. Similarly, rural children somewhat more frequently reported better health than

urban children, perhaps reflective of somewhat higher SES and two-parent family structure of this group.

BMI

A similarly high proportion of children in this study were at risk of overweight or overweight to that found in national surveys – 20% of the children were overweight and 12% were obese. The 2004 CCHS survey (Tjepkema and Shields, 2005b) found that 26% and 8% of 6-11 year olds were overweight and obese respectively. In this study, 34% of the girls and 30% of the boys were either at risk of overweight or overweight.

However, gender differences within each BMI level were striking, with almost twice as many girls being at risk of overweight and twice as many boys being overweight. These rates vary noticeably from the findings of 2004 CCHS study, which found that overweight and obesity rates for 6-11 year old girls and boys were within 1-2% of each other. Although the CCHS height and weight data were measured, as they were in this study, the age range was quite different. These frequencies are also quite different from the levels of overweight and obesity found in the HBSC survey, where rates for 11 year olds were noticeably lower than this study, with the exception of overweight boys. Eleven percent of girls and 15% of boys were overweight, and 4% and 5% of girls and boys were obese. Differences may be due to the HBSC's use of self-report measures, which tend to underestimate prevalence levels (Tjepkema & Shields, 2005b).

Caution, however, must be taken in making generalizations about the BMI rates found in the study due to the sample size. No analysis of the potential relationships between BMI and health status or other variables such as healthy eating and physical activity levels were undertaken due to cell size limitations. Furthermore, the importance of disaggregating BMI scores across ages and gender to avoid misconstruing such critical data, led to the decision not to use BMI data as an indicator of obesity or overweight. As a result, health status was used as a proxy measure for overweight and obesity. As documented in the literature review, the relationship between obesity and health is well established.

Other Health Indicators – Smoke Exposure and Dental Care

Most of the children in the study did not live with anyone who smoked in the house, and of this group, significantly more rural than urban children lived with non-smokers. No relationship between family smoking and health status was found, however there was a significant association between living with non-smokers and good dental care. Children who reported good health, not surprisingly, also reported good dental care habits. The large majority of these children reported very good dental care, however it is important to note that 13% did not have annual dental checkups. Good dental care was positively associated with health status, though it is interesting to note that of children who reported poor health status, the majority (71%) reported good dental care.

Healthy Eating and Physical Activity

Healthy eaters were children who reported eating fresh fruits, raw and cooked vegetables, and had low rates of consuming sweets and sugar sweetened soft drinks. They also regularly ate breakfast, ate three meals a day, most often ate with their parents and consumed little restaurant foods. Positive trends were found between healthy eating and high SES, living with both parents, and living in a rural location. It was surprising that none of these trends were statistically significant, based on the general consensus in the literature that socioeconomic, geographic and family variables are likely to be related to health.

The relationship between healthy eating and health in the literature, in terms of rates of overweight and obesity, is 'indeterminate.' To date, a consistent association has not been found. Using health status as a proxy measure for obesity, this study found a positive, but non-significant trend for healthy eaters to more frequently report good health. Interestingly, healthy eating was found to be significantly associated with two health status indicators – living with non-smokers and good dental habits.

There was an important group of children in this sample that are not eating as healthfully as would be hoped. The size of this group ranged from 15-58%, depending on the variable. Most likely, these children do not have parents who are providing regular access to healthy foods and activities or who provide role models at home to reinforce these habits. Parental influence and role modeling have been found to be among several important correlates of healthy behaviours in children.

No significant associations were found between physical activity levels and demographic or socioeconomic variables, though a positive trend was found between high physical activity levels and high socioeconomic status. One indicator of SES, family structure, was found to be significantly associated with physical activity – children who lived with both parents were more physically active than those who did not. In contrast to healthy eating, a significant positive association was also found between physical activity and health status. Using health status as a proxy measure for obesity, the evidence in the literature for this finding is inconsistent.

Descriptors of the type and frequency of physical activity provided insights into how physically active these children are and what they do. These children were extremely physically active, and they were significantly more active in free time physical activity than in organized or competitive sports or clubs, though 2/3 also reported being involved in competitive sports. Given the concern worldwide that children are becoming less active, this finding was somewhat unexpected. Furthermore, in a culture in which organized activities dominate and there often seems to be little opportunity for unstructured physical activity, it was reassuring to find that these children reported spending significantly more time in free time physical activities than organized ones.

While the majority of children reported regularly meeting the Canadian active living guideline of being physically active for at least 60 minutes a day, they also spent a

significant amount of time in sedentary activities. The majority watched TV for at least 2 hours a day. It seems likely that when not sedentary, these children are spending a significant amount of time in moderate-vigorous physical activity.

These findings indicate that there are groups of school-age children who are acceptably physically active, although the reasons for this were not investigated in this study. One explanation is that the predominance of relatively high SES, family stability, and positive family health practices in this sample resulted in high levels of healthy eating and physical activity.

Self-Efficacy and Health Locus of Control

Self-Efficacy for Healthy Eating and Physical Activity

The majority of children were found to be confident in their ability to eat healthfully and be physically active. Only one significant association was found between the self-efficacy variables and demographic or SES variables. Children who lived in rural areas were more confident in their capability to eat healthfully than children who lived in an urban environment. It may be that these children were more likely to have family environments that emphasized healthy eating.

Nutrition self-efficacy was found to be positively associated with good dental habits, but not with overall health status. This is somewhat unexpected, but with the limited number of nutrition self-efficacy items, conclusions about the lack of relationship are not warranted. In comparison, a very strong relationship was found between self-efficacy for physical activity and overall health. In addition, the majority of children both perceived themselves to be capable of physical activity and reported being very physically active.

Children who were high in nutrition or physical activity self-efficacy were significantly more likely to report eating healthfully, and significantly more children in the high nutrition self-efficacy group reported being physically active. These findings support the consensus in the literature that internal beliefs are critical to health choices and actions. As discussed in the literature review, the potential relationships among healthy eating, being physically active and obesity are extremely critical to learn more about. It is most likely that, in conjunction with other important determinants, the combination of eating healthfully and getting enough moderate-vigorous physical activity supports good health and longevity. Self-efficacy for both these determinants of health may play an important role in determining how healthfully children eat and how physically active they are.

In this study, self-efficacy behaviours were not found to be significantly associated with intention to be physically active. However, a trend was found for physical activity SE to be positively associated with intention to be active. Although this trend could not be confirmed due to clumping of the data, it is possible that a larger sample would clarify this relationship, as other studies have found a positive relationship between these two variables.

Multidimensional Health Locus of Control

Interestingly, investigation of the MHLC nutrition variable found some associations similar to those for nutrition self-efficacy. Children from rural areas reported high (internal) health locus of control for nutrition. Although this construct was not significantly associated with health status, unlike nutritional self-efficacy, a positive trend was found. MHLC for nutrition was significantly associated with healthy eating habits and physical activity levels. In contrast to the lack of association between nutrition or physical activity self-efficacy and intention to be physically active, there was a significant positive association between physical activity intention and MHLC for nutrition. This finding suggests a potential relationship between perceived control over physical activity, and this surrogate measure for physical activity. Further research is to elucidate this relationship.

Though a trend was found for a positive association between the two psychosocial nutrition variables, it was not significant. This trend, however, may be an indication that further integrated research into both internal psychological and external social factors should be pursued. This perspective differs from much of the literature, which because of inconsistent relationships between internally oriented variables and children's dietary behaviours, recommends putting more focus on parental influence and control. This study suggests that children in this age group, may see themselves as having control over what they eat, with parental support rather than control. Clearly, how psychological and social variables that affect dietary behaviours interact is a complex and challenging question, but the findings suggest an interesting perspective to add to present understanding.

Health locus of control for overall health was significantly associated with good health. Children who scored high on internal MHLC also reported being very healthy. This is an important finding, given the paucity of research with this construct, and the importance of location of control to children's health and obesity. However, no associations were found for more specific health influences – dental care and living with smokers. This lack of relationship was perhaps unexpected, although understandable. These are two health variables over which children in this age group would have very little, if any, control. Surprisingly, no other significant relationships were found between this construct and healthy eating, being physically active, or intention to be physically active.

Health Behaviours and Psychosocial Constructs as Predictors of Health

Linear regression analyses found that only overall physical activity predicted health. Given the controversy and lack of consensus in the literature about whether diet or physical activity is more important to overall health, overweight and obesity, this finding lends support to the contribution of physical activity but not healthy eating. The debate continues.

When the three psychosocial constructs related to healthy eating and being active were analyzed, only self-efficacy for physical activity predicted health. It may be that children are more likely to have control over and see themselves as capable in the realm of physical activity than their eating habits. In fact, at this age, they are more likely to have some control over their physical activities than what, with whom and where they eat. Parents still largely

control their eating habits, but perhaps less so for overall physical activity levels. The focus group findings add additional insights on this issue. This an important difference when deciding whom to target for prevention programs that combine healthy eating and physical activity changes for children.

Qualitative Insights

Teachers' Views

When asked about their students' health, teachers clearly felt that health levels were not high and commented almost exclusively on poor health habits. These covered a wide range of behaviours including lack of interest in exercise, sports, and healthy living, replacing outdoor play with computer games, and consuming highly processed foods.

Teachers reported that almost a third of children came to school without breakfast some days each week and a majority of students did not regularly eat healthy lunches. Most teachers said that less than half their students were physically active at and outside of school, and between a third and half of the students preferred sedentary activities.

In comparison to their views that children often did not eat healthfully or were active enough, many teachers felt that their students were interested in having some control over what they eat, how physically active they are, and in being healthy. In addition, the explanatory comments added other dimensions, which assist in understanding the complexity of the environment within which children live and grow. Food preferences, parental influence, role modeling and control, the disconnect between knowledge and behaviour, the cost of organized sports, and community influences were all mentioned. In commenting on parents' views on their children's health, most teachers felt parents did not see health as extremely important, but explained that this was due to constraints of time, money, knowledge and motivation. Teachers further commented on the challenges faced by low-income families and the overall need for better nutrition education for children and parents.

It is interesting to note that teachers' concerns that their students do not eat healthfully or get enough physical activity are not confirmed by the majority of students' reported behaviours.

Parents' Views

In contrast, the views expressed in a focus group with parents suggested that at least some parents are extremely concerned about their children's health and are willing to make every effort possible to ensure their children eat healthfully and are physically active.

Parents acknowledged that cost and working out of the home were key factors that influenced families' ability to eat healthfully. They felt that establishing good eating habits early in their children's lives was very important, and that the school had an important role to play in providing a healthy eating environment for their children's healthy eating. Parents expressed concerns about children not getting enough free-time outdoor physical activity and that often they had to limit their children's time on the TV, computer and video games.

Further, they felt it was important to have rules about what children could eat or how they active were, but most indicated that they gave their children choices within certain boundaries. Consistent application of rules was important, although, especially in families where parents worked, some rules were hard to enforce all the time and compromises were inevitable. As well, parents thought that it was important for their children to "buy in" to healthy practices, that children sometimes need to learn from the consequences of their actions, and that healthy choices were often trade-offs.

Overall, these parents indicated that children need to be given some control over what they eat and what they do to be physically active, but that the parameters within which these choices take place need to be established by parents. They all expressed a high level of responsibility for ensuring that their children are healthy.

From discussions held with the principal, teachers and parents, this school and parent community appeared to be extremely proactive and possibly somewhat atypical in its efforts to find healthy food options and strongly promote regular physical activity at home and at school. It should be noted that the other study schools also provided similarly supportive health environments for their students, as indicated in early discussions with principals and teachers. Thus, it would appear that personal, social and environmental factors all impact children's health, undoubtedly through complex interactions and influences.

5.2 Study Limitations and Strengths

This study suffers from the limitations of cross-sectional design, small sample size and reliance predominantly on self-report data that is common in much of the research in this field. The scope, analysis and interpretation of the findings are limited by these factors. Causation cannot be assigned due to the cross-sectional design which used data collected at one point in time; the sample is not representative of a larger population of school-age children, and self-report data lacks the objectivity of observational measures. The physical activity data are also limited by seasonal considerations, given that the data were collected in late winter in Canada.

The nature of the data precluded more sophisticated analysis and the existing analysis was limited by sample size. Although physical measurements were used to calculate BMI, sample size limited its use as an indicator of overweight and obesity in children. As a result, health status was used as a proxy measure, and this may limit generalization of the findings to other studies. It should also be noted that, although the link between obesity and health is well established for adults, the consequences of obesity for children and youth may not have manifested and as a result, health status may not always be the most appropriate proxy. This is an important area for further study.

Additional potential limitations include the method of questionnaire construction, the limited number of items used to measure psychosocial constructs, and the lack of differentiation of subfactors within the items used for each construct. It is possible that using a somewhat diverse and limited set of items to develop the student questionnaire could weaken the effectiveness of the instrument. The psychosocial items were taken from proven

instruments, but the individual items from the various instruments had not previously been used together. The validity and reliability of the student questionnaire should be investigated.

The psychosocial construct items may have suffered from limitations of quantity and lack of differentiation of subscale items. For example, the SE scale can be subdivided into barriers, support seeking and positive alternatives subscales, and the MHLC scale divided into internal, powerful others and chance subscales. The findings may have been affected by lack of discrimination of the dimensions within each construct. The study's limited scope precluded more detailed investigation of these constructs, but at the same time, it could be argued that, for a small pilot study, this differentiation was less important than investigating the overall outcome of related psychosocial constructs.

The research was intended to be a pilot study to initiate data gathering and analysis that has not previously been undertaken at the local level, and several strengths attest to its usefulness. A high response rate was achieved, especially for an active consent procedure. Although the utility of the BMI measure was limited, it was based on physical measurements which improve the accuracy of the data on children's levels of overweight and obesity. The student questionnaire contained predominantly valid and reliable items from proven instruments. The quantitative findings from the student questionnaire were supplemented with descriptive qualitative data from teachers and parents. A health profile of 9-11 year old children in a local community of south central Ontario, Canada was created that did not previously exist and the study was broad in its inclusion of health status, two important determinants of health (healthy eating and physical activity) and two psychosocial mediators of health (self-efficacy and multidimensional health locus of control).

5.3 Conclusions and Recommendations

This study undertook to gather information about the health status of 9-11 year olds in a south central Canadian community, their dietary and physical activity behaviours, and psychosocial mediators of health. Health status was used as proxy for obesity.

The study sample was somewhat atypical, having predominantly high family affluence levels, stable family environments, and living in healthy environments. Reported levels of overall health, healthy eating and physical activity were also higher than comparable population groups. Nonetheless, these children are an important group to study, as links between positive levels of socioeconomic status, family stability, and determinants of health are born out. Similarly, gender differences and health status are confirmed.

The strength of the relationships of all the physical activity-related variables is an important finding, suggesting either that physical activity is a more significant contributor to health and obesity prevention than healthy eating, or as is certainly more likely, the two are very different behaviours which children view and report on quite differently.

Several findings of the study are recommended for further investigation. Replication of the study using a larger sample would enable the use of BMI measurements directly, and also

allow for validation of the research instruments. Further attention should be given to psychosocial mediators of children's health behaviours, given the current paucity of research related to children, and the potential utility of the two constructs investigated in this study.

Although an association between intention to be physically active and self-efficacy for physical activity was not confirmed in the study, the positive trend should be pursued with larger samples. Other studies have found results that supported this relationship, and it is an important one to consider, as further research investigates health, obesity and determining factors in childhood. The finding of an association with nutrition health locus of control also points to the possibility that intention to be physically active may be an acceptable surrogate for actual physical activity.

This study resulted in the establishment of a baseline health profile of 9-11 year old children in the Haliburton, Kawartha, Pine Ridge District Health Unit. The study's instruments can now be used to initiate ongoing data collection of health status information about school-age children within the health unit's jurisdiction. It is hoped that this study may be of assistance to community agencies and the health unit in learning more about the health of our children and in considering much needed action to counteract the threats posed to their health by overweight and obesity. The relevance of the study's findings for childhood obesity prevention initiatives should be considered.

There are important aspects of overweight and obesity in children that were not included in this study. Their omission was the result of time and resource constraints, and was in no way intended to diminish their importance. These included the critically important behaviour of dieting and body image, especially for preadolescent and adolescent girls, the potential impact of maternal dieting on childhood obesity, and a more detailed review and assessment of the literature on parental influence and control over children's health behaviours. These areas are recommended for attention as research in the field of childhood obesity prevention further develops.

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APPENDIX 1

RESEARCH INSTRUMENTS AND CONSENT FORM

A. Student Questionnaire

B. Teacher Questionnaire

C. Focus Group Facilitation Guide

D. Parent/Guardian Consent Form for Student Participation

A. STUDENT QUESTIONNAIRE

NUTRITION and PHYSICAL ACTIVITY SURVEY
INSTRUCTIONS – Read aloud by Researcher

- Hi, my name is (enter name). I am surveying students in Grades 4 and 5 for a research project that I am doing.

- I am going to ask you to answer some questions about yourself and your health, what you eat and what kinds of physical activities you participate in. Most of the questions will ask you something specific, like your age, or will make a statement and ask you to pick an answer that best fits you from a list of choices.

- This is not a test, and there are no right or wrong answers. What is most important is that you pick the answer that you feel best describes what you do or how you feel.

- I am going to read the questions to you and you can follow along in your booklet. I can re-read questions but I can't help you answer them. What I would like you to do is answer each question in the way that best describes you, what you do and your feelings.

- Your answers will be completely confidential and no one will ever know which answers were yours because your name is not on your booklet.

- For each question, listen to it and read along in your booklet. Then put an **X** in the box or circle that best answers the question for you. If you want to change your answer, clearly scratch it out or erase it, and put your **X** in the box you wish to choose.

- Please don't work ahead – follow along as I read the questions. Some of them are a little complicated and I want to explain how to answer them to you before you start answering.

- Also, the last item of the questionnaire is a space for your height and weight. Leave this blank, as I will be taking them for those students whose parents agreed on the form.

- There is no time limit for completing the questions, but it won't take too long – about a half an hour.

- Let's do a few examples to give everyone some practice. Turn to the first page of your booklet. Here are three practice questions that we can do together.

GRADE 4 and 5 HEALTH SURVEY

WELCOME!

HERE ARE A FEW PRACTICE QUESTIONS:

Please answer the questions below by putting an **X** in the box or circle that best describes you, like this: ☒ **OR** ⊗

1. My favourite colour is blue: Yes ☐ No ☐

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2. Put an **X** in the circle that best describes **you** for the question:

   How often do you feel really happy?

   ○ Never ○ Almost Never ○ Sometimes ○ Almost Always ○ Always

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3. Put an **X** in the box that best describes **how much you agree or disagree** with the statement:

   It is not healthy to smoke. Do you –

   ☐ Completely Agree ☐ Somewhat Agree ☐ Undecided ☐ Somewhat Disagree ☐ Completely Disagree

Turn to the next page and we will start with Question 1 at the top of the page.

GRADE 4 and 5 HEALTH SURVEY

WELCOME!

Remember, answer the questions by filling in the answer or by putting an **X** in the box or circle that describes you or your family, like this: ☒ **OR** (X)

1. How old are you today? _____ years old (for example, 9 years old)

2. What is your date of birth? _____ (for example, May 18, 1994)

3. What grade are you in now? Grade 4 ☐ Grade 5 ☐

4. Are you a girl or a boy? Girl ☐ Boy ☐

5. Do you have your own bedroom for yourself? Yes ☐ No ☐

6. Does your family own a car, van or truck?

☐ No ☐ Yes, one ☐ Yes, two or more

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7. During the **past twelve months (a year)**, how many times did you travel on holidays (vacation) with your family?

☐ Not at all ☐ Once ☐ Twice ☐ More than twice

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8. How many computers does your family own?

☐ None ☐ One ☐ Two ☐ More than two

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9. Who do you live with most of the time?

- ☐ I live with both of my parents
- ☐ I live with one of my parents
- ☐ I live with one of my parents and a stepparent, or a parent's girlfriend or boyfriend
- ☐ I live with a foster family
- ☐ If none of these apply to you, please write down whom you live with most of the time **below** →

_____

Now there are some questions about your health. Please choose the answer that best fits for you. Remember there are no right or wrong answers. Put an X in the circle that is the best answer for you.

10. How is your health?

Poor Fair Good Very Good Excellent

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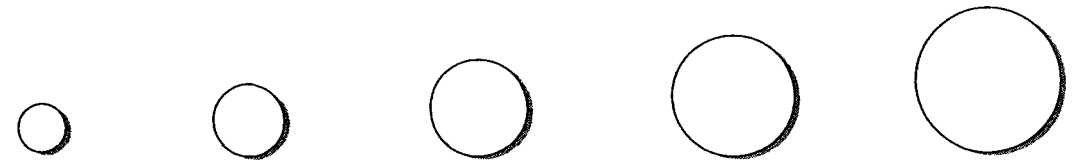
11. How often do you feel really strong?



Never Almost Never Sometimes Almost Always Always

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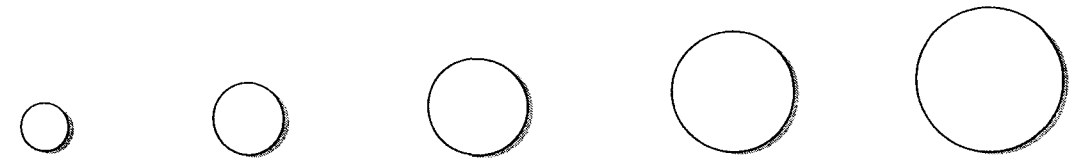
12. How often do you feel really healthy?



Never Almost Never Sometimes Almost Always Always

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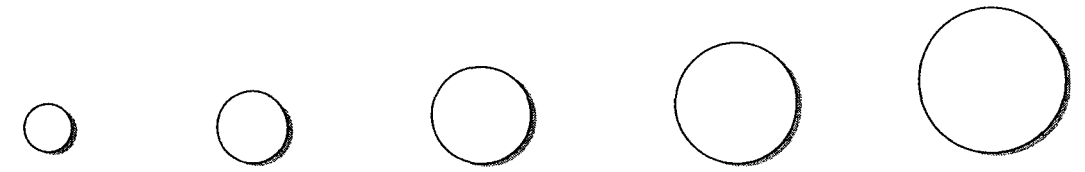
13. In the **past 4 weeks**, how often did you have a sore throat?



Never Almost Never Sometimes Almost Always Always

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14. In the **past 4 weeks**, how often did you have a bad stomachache?

Never Almost Never Sometimes Almost Always Always

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15. In the **past 4 weeks**, how often did you have a pain that really bothered you?

Never Almost Never Sometimes Almost Always Always

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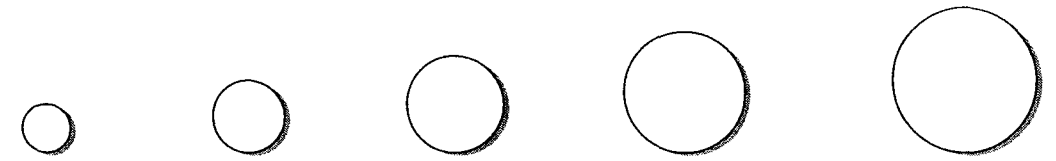
16. In the **past 4 weeks**, how often did you have trouble breathing?



Never Almost Never Sometimes Almost Always Always

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17. In the **past 4 weeks**, how often were you too sick to play at home?

Never Almost Never Sometimes Almost Always Always

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18. In the **past 4 weeks**, how often were you too sick to play outside?

Never Almost Never Sometimes Almost Always Always

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19. Does anyone in your family smoke in your home? Yes ☐ No ☐

If you answered **yes**, put an **X** in all the boxes of people who smoke in your house.

☐ Parent, guardian or step or foster parent, parent's boy or girlfriend

☐ Brother, sister and/or step, half, foster brother or sister

☐ Other relative

☐ Other – Who? _____

20. How often do you go to the dentist?

☐ Once every 6 months ☐ Once a year ☐ Once every few years ☐ Never

21. How often do you brush your teeth?

☐ Never ☐ Less than once a week ☐ At least once a week, but not daily ☐ Once a day ☐ More than once a day

Now there are some questions about your eating habits – what types of food you eat and how often you eat them.

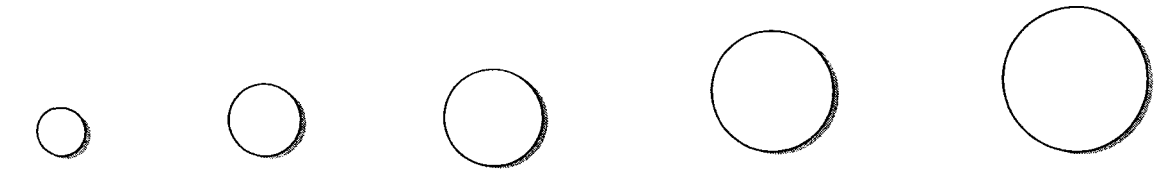
22. How many times a week do you usually eat or drink the following:

	Never	Less than once a week	Once a week	2-4 days a week	5-6 days a week	Once a day, every day	Every day, more than once
Fresh fruit	☐	☐	☐	☐	☐	☐	☐
Raw vegetables	☐	☐	☐	☐	☐	☐	☐
Cooked vegetables	☐	☐	☐	☐	☐	☐	☐
Sweets (candy or chocolate)	☐	☐	☐	☐	☐	☐	☐
Coke or other soft drinks that contain sugar	☐	☐	☐	☐	☐	☐	☐

23. How often during the week do you usually have **breakfast** (more than a glass of milk or fruit juice)?

☐	☐	☐	☐	☐	☐	☐	☐
Never	1 day	2 days	3 days	4 days	5 days	6 days	7 days

24. In the **past 4 weeks**, how often did your parents eat meals with you?



No days Very Few Days Some Days Almost Every Day Every Day

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25. In the **past 4 weeks**, how often did you eat three meals a day?

No days Very Few Days Some Days Almost Every Day Every Day

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26. In the **past 4 weeks**, how often have you eaten at a restaurant, take-out or fast food restaurant?

No days Very Few Days Some Days Almost Every Day Every Day

Now there are some questions about what you do when you are physically active.

Physical activity is any activity that increases your heart rate and makes you get out of breath some of the time. Physical activity can be done in sports, school activities, playing with friends, or walking to school. Some examples are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, basketball, skiing and football.

27a. How many times a week do you usually participate in competitive team sports such as hockey, soccer, basketball, baseball, or volleyball?

☐	☐	☐	☐	☐	☐	☐
More than once a day	Once a day, every day	5-6 days a week	2-4 days a week	Once a week	Less than once a week	Never

27b. How many times a week do you usually participate in competitive sports that you do on your own such as swimming, diving, skiing, snowboarding, or running?

☐	☐	☐	☐	☐	☐	☐
More than once a day	Once a day, every day	5-6 days a week	2-4 days a week	Once a week	Less than once a week	Never

27c. How many times a week do you usually participate in organized physical activities such as dance classes, martial arts classes, or swimming classes?

☐	☐	☐	☐	☐	☐	☐
More than once a day	Once a day, every day	5-6 days a week	2-4 days a week	Once a week	Less than once a week	Never

27d. How many times a week do you usually participate in physical activities that you do in your free time such as swimming, rollerblading, skiing, bike riding, skateboarding, tennis, skating, basketball, playing and helping your family outdoors? Think about what you do at school and outside of school.

☐	☐	☐	☐	☐	☐	☐
More than once a day	Once a day, every day	5-6 days a week	2-4 days a week	Once a week	Less than once a week	Never

28. In the **past 4 weeks**, how often did you run hard when you played or did sports?

No days | Very Few Days | Some Days | Almost Every Day | Every Day

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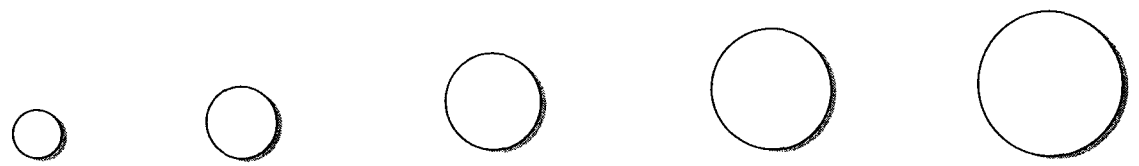
29. In the **past 4 weeks**, how often did you play active games or sports?



No days | Very Few Days | Some Days | Almost Every Day | Every Day

Now I would like to ask about how much time you spend being physically active in more detail. Remember what we said earlier about what physical activity is. It is any activity that increases your heart rate and makes you get out of breath some of the time. It can be done in sports, school activities, playing with friends, or walking to school. Again, some examples are running, brisk walking, rollerblading, biking, dancing, skateboarding, swimming, soccer, and basketball.

For the next two questions, add up all the time you spend being physically active.

30. Over the <u>past</u> 7 days, on how many days were you physically active for a total of **<u>at least 60 minutes (one hour)</u>** each day? This includes all the physical activity you do in and out of school and the minutes don't have to have been done all at one time.

☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

31. Over a typical or usual week, on how many days are you physically active for a total of **at least 60 minutes (one hour)** each day? This includes all physical activity you do in and out of school and the minutes don't have to have been done all at one time.

☐ 0 days ☐ 1 day ☐ 2 days ☐ 3 days ☐ 4 days ☐ 5 days ☐ 6 days ☐ 7 days

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32. **About how many hours a day** do you usually watch TV (including videos) in your free time?

☐ none at all ☐ about a half hour ☐ about 1 hour ☐ about 2 hours ☐ about 3 hours ☐ about 4 hours ☐ about 5 hours ☐ about 6 or more hours

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33a. **About how many hours a day** do you usually use a computer for playing games in your free time?

☐ none at all ☐ about a half hour ☐ about 1 hour ☐ about 2 hours ☐ about 3 hours ☐ about 4 hours ☐ about 5 hours ☐ about 6 or more hours

33b. **About how many hours a day** do you usually use a computer for emailing or chatting with your friends in your free time?

☐ none at all ☐ about a half hour ☐ about 1 hour ☐ about 2 hours ☐ about 3 hours ☐ about 4 hours ☐ about 5 hours ☐ about 6 or more hours

33c. **About how many hours a day** do you usually use a computer for surfing the Internet in your free time?

☐	☐	☐	☐	☐	☐	☐	☐
none at all	about a half hour	about 1 hour	about 2 hours	about 3 hours	about 4 hours	about 5 hours	about 6 or more hours

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Now there are some questions about how you feel about your eating habits and being physically active.

34. For each statement, pick the answer that bests describes how you feel, by putting an **X** in the box that shows how much you agree or disagree with the statement.

Here's an example:

You are given the statement "**Candy is good for me**", and asked to pick an answer from five choices:

- that you completely agree with the statement;
- that you somewhat agree with the statement;
- that you are undecided about the statement and don't agree or disagree;
- that you somewhat disagree with the statement; or
- that you completely disagree with the statement.

Which choice best describes your feelings? Put an **X** in the box that shows how much you agree or disagree with the statement, "Candy is good for me."

	Completely Agree	Somewhat Agree	Undecided	Somewhat Disagree	Completely Disagree
Candy is good for me	☐	☐	☐	☐	☐

Now we will read the statements below and you can decide how much you agree or disagree with each one. For each statement, pick the answer that bests describes how you feel, by putting an **X** in the box that shows **how much you agree or disagree** with the statement.

	Completely Agree	Somewhat Agree	Undecided	Somewhat Disagree	Completely Disagree
I can ask my parent or other adult to take me to a physical activity or sport practice.	☐	☐	☐	☐	☐
I can ask my parents to buy more raw fruits and vegetables.	☐	☐	☐	☐	☐
I can be physically active no matter how busy my day is.	☐	☐	☐	☐	☐
I do not eat fast food or junk food because they are bad for me.	☐	☐	☐	☐	☐
I can be physically active no matter how tired I may feel.	☐	☐	☐	☐	☐
I know junk foods are unhealthy, but I eat them because my family eats them.	☐	☐	☐	☐	☐
I can be physically active even if it is hot or cold outside.	☐	☐	☐	☐	☐
I can tell my family that we should eat more fruits and vegetables.	☐	☐	☐	☐	☐
I can be physically active even if I have a lot of homework.	☐	☐	☐	☐	☐

	Completely Agree	Somewhat Agree	Undecided	Somewhat Disagree	Completely Disagree
I am in control of my own health	☐	☐	☐	☐	☐
I can ask my parent or other adult to do physically active things with me.	☐	☐	☐	☐	☐
I have the skills I need to be physically active.	☐	☐	☐	☐	☐
I don't eat more raw fruits and vegetables because my parents don't like to eat them.	☐	☐	☐	☐	☐
My family has a lot to do with my becoming sick or staying healthy .	☐	☐	☐	☐	☐
I can be physically active after school even if I could watch TV or play video or computer games instead.	☐	☐	☐	☐	☐
The main thing that affects my health is what I do.	☐	☐	☐	☐	☐

35. Pick **one answer** from the list that best describes you:

During my free time on most days:

- I am sure I **will not** be physically active. ☐
- I **probably will not** be physically active. ☐
- I **may or may not** be physically active. ☐
- I **probably will** be physically active. ☐
- I am sure I **will** be physically active. ☐

THE END - THANK YOU FOR PARTICIPATING!

Height: _____ cm. Weight: _____ kg.

B. TEACHER QUESTIONNAIRE

TEACHER SURVEY about NUTRITION and PHYSICAL ACTIVITY of ELEMENTARY SCHOOL CHILDREN

SCHOOL: _____ **GRADE(S) TAUGHT:** _____

The following questions are being asked to learn about your views on the health of your students, their eating habits and physical activity levels. If you have additional comments or need more space when answering a question, please write on the back of the questionnaire, identifying the question. All responses will be kept confidential, and no teacher will be identified by name.

Please answer the following questions about your students' health by putting an X in the box that best reflects your present assessment related to each question.

1. In general, how would you rate the overall health of your students?

☐ Poor ☐ Below average ☐ Average ☐ Above average ☐ Excellent

Please explain or elaborate on your answer.

_____

_____

_____

_____

_____

2. In your opinion, how important do the parents of your students think their children's health is?

☐ **Very important** ☐ **Somewhat important** ☐ **Important** ☐ **Somewhat unimportant** ☐ **Not very important**

Please explain or elaborate on your answer.

_____

_____

_____

_____

_____

3. **How many of your students are currently away from school due to a significant illness (e.g., an illness that has kept them away for more than two weeks)?**

☐ More than 6 ☐ 5-6 ☐ 3-4 ☐ 1-2 ☐ None

What types of illnesses do these children have?

_____

_____

_____

_____

4. How would you assess your students' interest in being healthy?

☐ Not at all interested ☐ Somewhat uninterested ☐ Interested ☐ Somewhat interested ☐ Very interested

Please elaborate on your answer.

_____

_____

_____

_____

_____

5. **What proportion of your students come to school not having eaten breakfast, at least twice a week?**

☐ More than 85% ☐ 70-85% ☐ 50-70% ☐ 30-50% ☐ 0-30%

_____

6. **What proportion of your students eats a healthy lunch (low fat, low sugar, fresh vegetables and fruit, majority of items not prepackaged) at least three times a week?**

☐ More than 85% ☐ 70-85% ☐ 50-70% ☐ 30-50% ☐ 0-30%

7. What proportion of your students is physically active at school and outside school?

☐ Almost everyone ☐ More than 3/4 ☐ More than 1/2 ☐ More than 1/3 ☐ Almost no one, very few

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8. What proportion of your students prefers sedentary activities?

☐ Almost everyone ☐ More than 3/4 ☐ More than 1/2 ☐ More than 1/3 ☐ Almost no one, very few

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9. How interested do you think your students are in having some control over what they eat?

☐ Very interested ☐ Somewhat interested ☐ Interested ☐ Somewhat uninterested ☐ Not at all interested

Please explain or elaborate on your answer.

_____

_____

_____

_____

_____

10. How interested do you think your students are in having some control over how physically active they are?

☐ Very interested ☐ Somewhat interested ☐ Interested ☐ Somewhat uninterested ☐ Not at all interested

Please explain or elaborate on your answer.

_____

_____

_____

_____

_____

Is there anything else you would like to add? Please provide any additional comments or thoughts you have on your students' health, eating habits or physical activity levels, their ability to control these behaviours, and their confidence in succeeding.

THANKS VERY MUCH FOR YOUR PARTICIPATION!

C. FOCUS GROUP FACILITATION GUIDE

1. Observational/Demographic Information

1. # of females/males M F
2. Approximate age of participants
3. # of children in school
4. Children's grade levels/ages
5. Ethnic composition

2. Nutrition – Areas for Discussion

6. What types of food do your children prefer to eat?
7. How often does your family have meals together?
8. How often does your family eat three meals a day?
9. How often does your family eat fresh fruit and vegetables?
10. Do children eat as healthfully as you think they should?
11. What are some the things that make it difficult to eat more healthfully?
12. How important do you think it is to eat nutritiously?

3. Physical Activity/Sedentary Behaviour – Areas for Discussion

13. What type of physical activities does your family take part in?
14. How much time do your children spend watching TV, playing computer and video games?
15. Do you think your children should be more active?
16. What are some the things that make it difficult for your children to be more active?
17. How important do you think it is to be physically active?

4. Behavioural – Areas for Discussion

18. Do/should your children participate in deciding what they eat?

19. Do/should your children participate in deciding the types of physical activities they are involved in?

20. Do your children participate in deciding how much TV they watch and computer games they play?

21. Would you change your family's eating patterns if your children asked you to? e.g., buy more foods with less sugar and fat, fresh fruits and vegetables?

22. Is it easy/difficult for you to eat healthfully and get regular physical activity?

23. Do you think it is easy/difficult for your children to eat healthfully and get regular physical activity?

D. PARENT/GUARDIAN INFORMED CONSENT LETTER AND FORM

Dear Parent/Guardian,

I am a student in the Masters of Public Health Program at Lakehead University, currently collecting information for my research on health behaviours of students in Grades 4 and 5. My research is focusing on children's eating habits and physical activity levels and how they may be related to preventing overweight and obesity.

Students will be asked to complete a questionnaire that asks questions about their health, the food they eat, the types of physical activity they get, and their views on what they could do to change. The questionnaire will be completed in the student's classroom during class time. Height and weight measurements will also be taken. Students who are not participating in the study will continue with their regular classroom work while the research is being conducted. Upon completion of the study, a summary of the results will be made available to the school, and can also be sent to you. Information will be provided to your child at the time of the study.

The information collected will be used as group data only. No individual students will be identified by name and all responses will be held in confidence by me. Results will be analyzed for any gender, socioeconomic status and ethnicity differences. The raw data (the answers from the questionnaires) will be securely stored at Lakehead University for seven years and then destroyed.

Please complete and return the bottom section of this letter to your child's teacher by _____. There will be no negative implications for your child if he/she does not participate. If you have any questions about this study or your child's participation in it, please call me at 905 372-2412. Should you change your mind about your child's involvement in this study, you may wish to notify the school principal.

Thank you for your assistance.

Sincerely
Kathryn Clinton
Graduate Student

CONSENT FORM

I have received an explanation about my child's participation in the study and its purpose. I understand the following:

1. My child is a volunteer and can withdraw at any time from the study.
2. There is no apparent danger of physical or psychological harm to my child.
3. The information provided by my child will be kept confidential.
4. I and my child will receive a summary of the study, upon request, following its completion.

I have read the above information and my signature on this form gives consent for my child,

_____ to participate in this study. *Please circle your preference below:*
(child's name)

I do / do not give permission for my child's height and weight measurements to be taken.

Parent/Guardian Signature _____ Date _____

I have read the above information and do not wish my child, _____ to participate in this study.
(child's name)

Parent/Guardian Signature _____ Date _____