ASSESSING THE IMPACT OF AN EXPOSURE-BASED INTERVENTION ON ELEMENTARY STUDENTS' LIKING, WILLINGNESS TO TRY AND TASTING OF THREE NEW FRUITS

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Assessing the Impact of an Exposure-Based Intervention on Elementary Students' Liking, Willingness to Try and Tasting of Three New Fruits

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Abstract

This study sought to assess elementary students' liking, willingness to try and tasting of three fruits introduced through their school's breakfast program. Students (n=325) from seven schools completed pre-tested questionnaires asking if they liked and were willing to try three test fruits [time 0]. These questionnaires were repeated eight weeks later [time 1]. Students were then offered each fruit 1x/week for eight weeks. Students completed the same questionnaires after this intervention [time 2] and after a 10 week follow-up period [time 3]. Fifty-seven percent (571/1002) of students returned signed parental/guardian consent forms. Of these students, 57% (325/571) completed all four sets of questionnaires. Although no significant increases in liking and willingness to try the test fruits were found, trends suggest the intervention may improve school children's tasting of the fruits offered. Recommendations from this study may be useful when designing future research of this nature.

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LIST OF ABBREVIATIONS AND SYMBOLS

#	Number
%	Percent
K	Kindergarten
M	Mean
N	Number
p	P-value
t	Probability distribution
X^2	Chi-square
Z	Test Statistic
BMI	Body Mass Index
CCHS	Canadian Community Health Survey
HIC	Human Investigations Committee
KES	Kids Eat Smart
KESF	Kids Eat Smart Foundation
MUN	Memorial University of Newfoundland
NL	Newfoundland and Labrador
PEI	Prince Edward Island
SD	Standard Deviation
SM	School Milk
SPSS	Statistical Package for the Social Sciences
WHO	World Health Organization

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CHAPTER 1

Introduction and Literature Review

1.1 Introduction

Diet and nutrition are important factors in the promotion and maintenance of good health throughout the life cycle (World Health Organization [WHO], 2002). As part of a healthy diet, the consumption of fruits and vegetables aid in preventing or delaying the onset of chronic disease and associated health conditions, including overweight and obesity. According to evidence presented in the World Health Report (WHO, 2002) low fruit and vegetable intake is among the top 10 risk factors contributing to mortality worldwide. Within Canada, low fruit and vegetable consumption has been recently reported among adults, youth and children (Statistics Canada, 2005; Statistics Canada, 2007). Healthy lifestyle behaviours established at an early age are carried into the adolescent and adult years (Kelder, Perry, Klepp & Lytle, 1994; Pender, 1987). Considering this, interventions focused on improving the eating behaviours of children, including increasing fruit and vegetable consumption, may serve to improve dietary behaviours, prevent chronic disease and promote the overall health of the population.

1.2 Prevalence of Chronic Disease and Obesity

The prevalence of chronic diseases and obesity has been on the rise in recent years and is evident not only on a global level, but on national and provincial levels as well (Statistics Canada, 2005, 2006; WHO, 2002, 2005, 2006).

1.2.1 Global Prevalence

Chronic diseases, including cardiovascular diseases, cancer and diabetes are major causes of death and disability worldwide. As per the World Health Report of 2001 (WHO, 2002) chronic diseases contributed to approximately 60% of reported deaths in the world. Lifestyle and dietary behaviours such as tobacco use, physical activity and nutrition are significant, yet modifiable contributors to the development of chronic disease (Willett et al., 2006). These behaviours also affect body weight, which is a known risk factor in the development of chronic disease (Jung, 1997; Willet et al., 2006).

Globally, more than one billion adults are overweight, classified as having a body mass index (BMI) of 25 to 30, and 300 million are obese, classified as having a BMI of over 30. This epidemic is also prevalent among children, where an estimated 22 million children worldwide under the age of five years are overweight (WHO, 2006). A BMI of 25 or greater has been associated with an increased risk of diabetes, coronary heart disease, stroke, gall bladder disease, various cancers and mortality (Jung, 1997). These associations are of concern considering the global overweight and obesity epidemic in child and adult demographies.

1.2.2 National and Provincial Prevalence

The prevalence of chronic disease in Canada is rising. The World Health Organization (2005) projects that over the next 10 years in Canada, deaths from all chronic diseases will increase by 15%, with deaths from diabetes alone increasing by 44%. Evidence suggests that obesity is a primary factor in the development of

hypertension, insulin resistance and dyslipidemia (Sorof & Daniels, 2002). Even more alarming is that these risk factors are increasingly being found among children, which if not addressed increases the risk of developing coronary heart disease in adulthood (Baker, Olsen & Sorenson, 2007; Bibbins-Domingo, Coxson, Pletcher, Lightwood & Goldman, 2007).

In the Atlantic Provinces, death rates due to cardiovascular disease and diabetes are the highest in Canada, followed by deaths from cancer (Public Health Agency of Canada [PHAC], 2006). According to the Canadian Community Health Survey (CCHS), compared to the national average of 4.9%, Newfoundland and Labrador (NL) has the highest percentage (6.8%) of the population aged 12 and over diagnosed with diabetes (includes Type 1, Type 2 and gestational) (Statistics Canada, 2006). The NL Centre for Health Information (2007) indicated that in 2004/2005 the mortality rate for those with diabetes was approximately two times higher than for individuals without diabetes. The province also had the second highest mortality rate from heart disease in Canada in 2004 (Government of Newfoundland and Labrador [Government of NL], 2004).

These provincial statistics are supported by local research conducted by a Memorial University student (Kettle, 2000), who indicated that future rates of cardiovascular disease in NL may remain high as a result of unhealthy lifestyle habits that have been occurring for many years. Kettle found that a high percentage of young NL adults

have excess body fat, most led a sedentary lifestyle during leisure time and a high percentage were regular cigarette smokers.

More recently, a Canadian study conducted by Alamian & Paradis (2009), found that nearly two-thirds (65%) of Canadian youth aged 10-17 years had two or more chronic disease behavioural risk factors, such as physical inactivity, sedentary behaviour, tobacco smoking, alcohol drinking and high body mass index. Furthermore, Salvadori et al. (2009) found that overweight and obesity were strongly associated with elevated blood pressure in children aged 4-17 years residing in a rural Canadian community. This evidence further suggests that precursors for chronic disease development may manifest during the childhood and adolescent years. A challenge remains to reduce the prevalence of chronic disease risk factors among Canadian children and youth.

1.2.3 Overweight/Obesity in Children Residing in Newfoundland and Labrador

Overweight and obesity among children, youth and adults in NL is higher than national averages. As of 2004, data from the CCHS indicate that 21% of NL adults were obese, a percentage which was significantly higher ($p < 0.05$) than the national average of 15% (Statistics Canada, 2005; Government of NL, 2005a). Similarly, rates of child and youth overweight and obesity have more than doubled over the past two decades. In 2004, the CCHS found that 26% of children and adolescents in Canada between the ages of 2 and 17 years were overweight. Comparatively, 36% of children and adolescents in NL were found to be overweight (Statistics Canada, 2005; Government of NL, 2005a).

The significant prevalence of child overweight and obesity in NL is further demonstrated in a study by Canning, Courage & Frizzell (2004) where researchers found that 25% of NL children aged 3.5 to 5 years who participated in the Provincial Preschool Health Check were either overweight or obese. Upon comparing these measurement results with those taken 13 years earlier, it was revealed that the number of overweight children had increased by 28% and the number of obese children had increased by 175%. Results such as these support the notion that over the last century, the percentage increase in obesity and overweight among North American children and youth is greater than the increase in any other disease or risk factor (Frank & Di Ruggiero, 2003).

1.3 Consequences of Chronic Disease and Obesity

Chronic disease and obesity can lead to negative impacts on many aspects of one's health, including physical (reviewed by Adair et al., 2007; Young-Hyman & Schlundt, 2001) and emotional health (reviewed by Adair et al., 2007; Must & Strauss, 1999). Overall, the treatment of these conditions has led to a financial strain on the health care system (Katzmarzyk & Janseen, 2004; reviewed by Ball & McCarger, 2003).

1.3.1 Physical Health

The development of overweight and obesity among children can have severe physical health consequences. For instance, risk factors for cardiovascular disease including hyperinsulinanaemia, impaired glucose tolerance, dyslipidaemia and hypertension

have been found in overweight children as young as five years old (Young-Hyman & Schlundt, 2001). Type two diabetes is increasingly being diagnosed among children and youth, which until recently was diagnosed only in adults. Other commonly found physical health consequences among overweight and obese children include sleep apnea, asthma, fatty liver disease, and early or delayed puberty (reviewed by Adair et al., 2007).

In addition to interfering with optimal growth and development, obesity present in childhood is a strong predictor for obesity in adolescence and adulthood (reviewed by Adair et al., 2007; reviewed by Ball & McCarger, 2003; reviewed by Flynn et al., 2006; Statistics Canada 2005; reviewed by Summerbell et al., 2005). A recent review conducted for the US Preventative Services Task Force indicated that the probability of developing adult obesity is 60% for overweight nine year olds and almost 80% for overweight 17-year-olds (Whitlock, Williams, Gold, Smith & Shipman, 2005). For most obese adults, sustainable weight loss is not achieved. Statistics indicate that adults in weight loss programs usually lose 10% of their weight, however one to two thirds of the weight is regained within 1 year and almost all is regained within 5 years (Technology Assessment Conference Panel [TACP], 1993). As such, preventing and treating obesity in the early stages of life may be useful at reversing current obesity trends.

1.3.2 Emotional Health

The impact of overweight and obesity on children extends far beyond their physical health, as it also impacts a child's emotional and social wellbeing. For instance overweight and obese children are at risk for developing low self esteem, negative body image and depression (reviewed by Adair et al., 2007). Furthermore, overweight and obese children are often the target of discrimination, teasing and bullying conveyed by their peers (Must & Strauss, 1999). A study by Schwimmer, Burwinkle and Varni (2003) found that when comparing quality of life scores, obese children rated their quality of life about the same as children living with cancer. The persistence of overweight and obesity into adulthood carries with it these emotional and social health consequences. For instance, obesity in young women has been associated with a lower income and a lower likelihood of marriage (Gortmaker, Must, Perrin, Sobol & Dietz, 1993). These facts are a reminder that the impacts of overweight and obesity extend beyond physical health concerns and can affect the development of key life and social skills.

1.3.3 Treatment Costs

The prevalence of obesity has a tremendous impact on the health care system. Research indicates that obese individuals are more likely to have increased rates of health service utilization to treat associated conditions, including chronic diseases (Trakas, Lawrence, & Shear, 1999; Bertakis & Rahman, 2005). According to Wolf and Colditz (1996), the direct costs of obesity are predominately from diabetes,

cardiovascular disease and hypertension while the indirect costs are a result of workdays lost, physician visits, disability pensions and premature mortality.

According to some estimates, direct health care costs to treat obesity related co-morbidities in the late 1990's were approximately $1.8 to $2.1 billion or 2.4 to 2.5% of Canadian healthcare expenditures (Katzmarzyk & Janseen, 2004; reviewed by Ball & McCarger, 2003). Considering the increasing prevalence of overweight, obesity and chronic disease in Canada (Government of NL, 2005a; Statistics Canada, 2005), the WHO (2005) estimates that these financial costs will continue to increase.

1.4 Relationship between Nutrition, Obesity and Chronic Disease

Dietary behaviour is a significant, yet modifiable contributor to the development of overweight, obesity and chronic disease (Willett et al., 2006; WHO, 2002). Following the recommendations outlined in Canada's Food Guide is associated with healthy weight maintenance and chronic disease prevention (Health Canada, 2007).

1.4.1 Eating Well with Canada's Food Guide

In Canada, the Food Guide has long been a practical tool outlining food intake patterns and providing guidance to help people and populations meet their nutrient requirements, maintain a healthy weight and reduce the risk of nutrition related chronic disease (Health Canada, 2007). First published in 1942, the Food Guide has been intermittently updated as nutrition science has advanced. In 2007, a revised version of the food guide was released. Titled *Eating Well with Canada's Food*

Guide, this version sought to improve the way Canadians understood and used the nutrition information presented. The 2007 version was developed based on current dietary reference intakes, changes in the food supply, patterns of food use, and use and understanding of the 1992 Food Guide. Despite the revision, children, adolescents and adults are still having difficulty meeting many of the Food Guides dietary recommendations (Statistics Canada, 2005, 2007).

1.4.2 Relationship between the Consumption of Fruits and Vegetables and Obesity

Fruits and vegetables have been identified as an important component of a healthy diet for all age groups (WHO, 2009). As part of a nutritional approach towards maintaining a healthy weight, fruit and vegetable consumption is encouraged as these foods are low in fat and energy and have a high water and fibre content (Health Canada, 2007). Furthermore their presence in the diet can reduce overall energy density, promote satiety and decrease total energy intake (Lin & Morrison, 2002; reviewed by Rolls, Ello-Martin & Tohill, 2004). The displacement of higher calorie foods with fruits and vegetables can help one's ability to maintain a healthy body weight and prevent overweight and obesity.

1.4.3 Relationship between the Consumption of Fruits and Vegetables and Chronic Disease

Meeting the Food Guide's fruit and vegetable recommendations has consistently been associated with a reduced risk of developing nutrition related chronic diseases including cancer (reviewed by Steinmetz & Potter, 1996; reviewed by Willett &

Trichopoulos, 1996), cardiovascular disease (Ishihara et al., 2008; Knekt et al., 2004) and diabetes (Ford, Mokdad, Giles & Brown, 2003). In their review of the scientific literature, Steinmetz and Potter (1996) found evidence indicating that increased fruit and vegetable consumption is consistent with a protective effect for cancers of the stomach, esophagus, lung, oral cavity and pharynx, endometrium, pancreas, and colon. Both Steinmetz and Potter (1996) and Liu (2004) have highlighted phytochemicals or antioxidant compounds such as carotenoids and flavonoids found in fruits and vegetables as components linked with reducing the risk of cancer. Both folate (Ishihara et al., 2008) and vitamin C (Knekt et al., 2004) have been found to have a role in the promotion of good cardiovascular health, with high intakes of vitamin C associated with a reduced incidence of heart disease. Furthermore, vitamins A and E as well as fibre found in fruits and vegetables have been associated with having a protective effect against the development of diabetes (Ford et al., 2003).

1.5 National and Provincial Fruit and Vegetable Consumption

Eating Well with Canada's Food Guide recommends that adults consume seven to ten servings of fruits and vegetables per day, children and adolescents aged nine to 18 years consume six or more servings per day, and children aged four to eight years consume at least five servings per day (Health Canada, 2007). Although these recommendations differ slightly from the earlier 1992 Food Guide recommendations, children and adolescents are still not meeting the recommendations. For instance, the 2004 CCHS indicated that seven out of ten children (70%) aged four to eight years failed to consume the minimum recommended number of five fruit and vegetable

servings per day (Statistics Canada, 2004). More recently, the Breakfast for Learning Foundation's 2007 annual report card on nutrition for school children reported that only 50% of Canadian children and adolescents (aged four to 18) are consuming the minimum of five fruit and vegetable servings per day (Breakfast for Learning Foundation, 2007).

These findings are consistent with those found in a Prince Edward Island study which indicated only 11% of children in grades four to nine consumed at least five servings of fruits and vegetables per day (Taylor, Bradley & Peacock, 2003). This is of concern since children and youth may not be consuming adequate nutrients to promote optimal growth and development. Furthermore, children and youth are less likely to be overweight or obese if they consume fruits and vegetables five or more times a day (Statistics Canada, 2005).

1.6 Determinants of Healthy Eating

The eating behaviours of children are influenced by a complexity of factors. In a review of the determinants that impact the healthy eating behaviours of children and youth, Taylor, Evers and McKenna (2005) categorized these factors as being either collective or individual.

1.6.1 Collective Determinants

Collective determinants that can impact children's nutrition behaviours include factors found within the economic and social environments.

1.6.1.1 Economic environment.

Economic factors such as a family's income, education and employment status influence the dietary intake of children and youth (Taylor et al., 2005). For instance, limited education can predispose one to unemployment, which ultimately restricts income. A low income can severely restrict the ability to purchase an adequate quantity of nutritious food. This may place a child's health at risk by creating a barrier that denies him or her access to a nutritious diet required for healthy development. These factors are particularly relevant in NL as it is the Canadian province with the highest percent of rural area residents falling below the low income cut off (Government of NL, 2005c). In its poverty reduction discussion document, the NL government reported the province had the third highest rate of child poverty in the country and that 15.5% of children were living in poverty (Government of NL, 2005c).

Taylor et al. (2005) suggest that when income is restricted, food pricing becomes the most important consideration in food choice. Between November 2007 and 2008, retail prices in Canada rose 19% for fresh fruit and 29% for fresh vegetables (Statistics Canada, 2008). Such unstable price inflation can make it difficult for Canadians, especially those with a limited income, to obtain and consume nutritious foods, such as fruits and vegetables. This could lead to a selection of less expensive foods that are often dense in sugar, fat and/or salt (reviewed by Basiotis, Kramer-LeBlanc & Kennedy, 1998). Thus, it is not surprising that children living in low

income families are also one and a half times more likely to be obese as compared to children in families with higher incomes (Statistics Canada, 2001).

1.6.1.2 Social environment.

Aspects of the social environment that impact on children's nutrition behaviours include the family, media, types of food available, portion sizes and school environment (Taylor et al., 2005).

1.6.1.2.1 Family.

In cultures around the world, the family plays a major role in influencing healthy eating behaviours of children. Positive dietary practices are often reinforced through parental modeling (Cullen, Baranowski, Rittenberry, & Olvera, 2000), consistency in meal structure (Taylor et al., 2005) such as having regular family meals and the availability and accessibility of healthy foods. Parental modeling of healthy eating behaviours (Brug, Tak, te Velde, Bere & de Boudeaudhuij, 2008) and the availability and accessibility of healthy food are associated with an increased preference and consumption of these foods by children (Hearn et al., 1998; Kratt, Reynolds & Shewchuk, 2000). Healthy dietary behaviours, including higher fruit and vegetable intakes have also been associated with an authoritative parenting style, characterized by high parental involvement and strictness, compared to an authoritarian (high strictness, low involvement) or neglectful (low strictness, low involvement) parenting style (Kremers, Brug, de Vries, & Engels, 2003; Patrick, Nicklas, Hughes, & Morales, 2005).

1.6.1.2.2 Media.

Potentially interfering with healthy familial influences are dietary messages from the media which can be persuasive, misleading and confusing. A recent study published in the Journal of the American Dietetic Association found that 91 percent of food advertisements shown during Saturday morning television programming aimed at pre-school and elementary school children were for foods or beverages high in fat, sodium or added sugars or were low in nutrients (Batada, Seitz, Wootan, & Story, 2008). These messages promote foods not recommended as part of a healthy diet and may influence a child's preferences, requests and/or consumption of these foods.

Food television advertisements aimed at children have been highlighted as a potential contributor in the development of childhood overweight and obesity. A recent study conducted by Halford and colleagues (2007) investigated the effect of television food advertisements on children's dietary intake. The researchers found substantial and significant increases in the children's overall energy intake ($p < 0.001$) whereby consumption of high-fat and/or sweet energy dense snack choices increased in response to the food ads. Increased energy intake was the largest among the obese children ($p = 0.04$). These data suggest that food advertisements stimulate the intake of energy-dense snacks and that overweight and obese children may be more responsive to food promotion.

Media messaging can also have the opposite effect on weight and overall health as it has been associated with the development of dieting behaviours and negative body

image among children and youth (reviewed by Adair et al., 2007). Evidence suggests a relationship exists between disordered eating, particularly dieting and binge eating and later onset of obesity (Tanofsky-Kraff et al., 2006; Reas & Grilo, 2007). However, whether this relationship is correlational or causal has not been established (reviewed by Hill, 2007). Conversely, childhood obesity has been correlated with increased risk for extreme dieting behaviours, binge eating and bulimia nervosa (Tanofsky-Kraff et al., 2006). These behaviours can compromise a child's growth, result in nutrient deficiencies and impact negatively on his/her metabolism (Neumark-Sztainer et al., 2006).

1.6.1.2.3 Foods available/portion size.

An issue in today's society is that low-nutrient high-energy foods are often more easily accessible than healthy foods and as such are competing with and displacing the consumption of more healthy foods (Taylor et al., 2005). This issue is further exacerbated by the increased availability of supersized food portions, which may lead to the over consumption of food. In a recent study conducted by Fisher (2007), children as young as two years old ate 39% more than usual when served a large meal and appeared unaware that they were consuming this amount. Children and youth are also increasingly consuming meals outside the home. National statistics from the United States in 1999 indicated that children ate 26% of meals and snacks away from home, which accounted for 32% of their total food calories and 36% of calories from fat (reviewed by Lin, Guthrie & Frazao, 1999).

1.6.1.2.4 School environment.

Second to the family, the school environment plays the greatest role at influencing positive eating behaviours among children (reviewed by Flynn et al., 2006; Budd & Volpe, 2006; Veugelers & Fitzgerald, 2005). Influencing factors include the school nutrition and health curricula, teacher and peer modeling, nutrition policies and the foods available in school (Taylor et al., 2005). For instance, studies have indicated an association between elementary students' access to high fat and calorie foods through school snack bars with a lower consumption of healthy foods, including fruits and vegetables (Cullen, Eagan, Baronowski, Owens, & de Moor, 2000; Cullen & Zakeri, 2004). Furthermore, a qualitative study conducted by the Canadian Diabetes Association (2002) of grade five to eight students in Nova Scotia found that limited visibility and availability of healthy choices in school cafeterias acted as a barrier to healthy eating.

Issues surrounding food availability at school have been found to exist in the NL school environment. In their 2001 report titled *Survey of Food and Nutrition Policies and Services in Newfoundland and Labrador*, the Coalition for School Nutrition raised concerns including the limited availability of healthy food choices (Coalition for School Nutrition, 2001). Addressing this concern has been outlined as an initial priority for the government of NL in their 2006 Provincial Food and Nutrition Framework and Action Plan, *Eating Healthier in Newfoundland and Labrador* (Government of NL, 2006c).

1.6.2 Individual Determinants

Individual factors that impact on children's nutrition behaviours include biological factors (e.g. age, sex), nutrition knowledge and food preferences.

1.6.2.1 Biological factors.

Age and sex differences have been found to impact the healthy eating behaviours of children. Upon comparing children in three age groups, consistent with that of the 2007 Food Guide (e.g. 4-8 years, 9-13 years and 14-18 years old) the Breakfast for Learning Foundation (2007) found that healthy food habits decline as children become older and the nutrition challenges increase. For instance, the Foundation found that the consumption of French fries and soft drinks increased with age and almost 60% of children between 9 and 18 years did not consume the minimum recommended daily fruit and vegetable servings. Furthermore, studies indicate that females, particularly in the adolescent years, tend to be at greater nutritional risk than males (reviewed by Levine & Guthrie, 1997).

1.6.2.2 Knowledge.

Children's nutritional knowledge of food may influence their nutritional behaviour. For instance, evidence from one study suggests that children's knowledge of the recommended number of daily servings of fruits and vegetables may translate into increased fruit and vegetable intakes (Reynolds et al., 2004). However, of the studies reviewed those which focused on improving children's nutritional knowledge of healthy foods yielded conflicting results. For instance, some studies varied in the specific knowledge attribute assessed (Gibson, Wardle & Watts, 1998; Edwards &

Hartwell, 2002; Reynolds et al., 2004), while another suggested that children's knowledge does not always influence their dietary behaviour (Wardle, Parmenter & Waller, 2000). This suggests that children's knowledge of healthy foods may not be the most appropriate variable to assess when attempting to improve their healthy eating behaviours.

1.6.2.3 Food preference.

Research has consistently highlighted 'preference' for a specific food item as a strong predictor of the actual consumption of that food (reviewed by Birch, 1999; reviewed by Drewnowski, 1997). In particular, interventions attempting to increase consumption of fruits and/or vegetables among children have found preference or whether the child liked the fruit and/or vegetable as a positive predictor of intake (Birch & Marlin, 1982; Baxter & Thompson, 2002). Although other sensory properties of food such as smell and appearance can affect preference, children's preferences are predominantly based on taste (Anliker, Bartoshuk, Ferris & Hooks, 1991).

Food preferences begin to develop at a young age, which some suspect may even be before birth. According to Mennella, Jagnow and Beauchamp (2001), flavours from a pregnant woman's diet are passed through the amniotic fluid and swallowed by their fetus. As such, the types of food and associated flavours consumed by pregnant women may be experienced by their infant before birth and before their exposure to solid foods. Breastfeeding may also play a role in shaping infant's food preferences.

Sullivan and Birch (1994) found that after 10 exposures to a new solid food, breastfed infants had greater increases in intake of the new food compared to those that were formula fed.

According to Birch and Fisher (1998), other factors that may shape infants' food preferences include their innate preference for sweet and salty tastes and a rejection of sour and bitter tastes. Birch (1987) further suggests that infants and children have a predisposition to reject novel or unfamiliar foods. This rejection of novel foods among infants and children has further been explained by the notion of 'neophobia' or the 'fear' of trying unfamiliar foods. One theory is that neophobia may have developed in humans as a method to protect them from ingesting dangerous and possibly deadly foods (Rozin, 1976). Today, neophobia is a common phenomenon among children which acts as a barrier to their consumption of a varied diet and essential nutrients (Falciglia, Couch, Gribble, Pabst & Frank, 2000). As such, neophobia has been found to be a strong predictor of children's low fruit and vegetable intake (Cooke, Carnell & Wardle, 2006; Pliner, 1994).

1.7 Exposure Based Interventions: Effects on Preference for and Willingness to Try Novel Foods

Acceptance of and preference for a particular food has been found to be a strong predictor of its consumption (Birch & Marlin, 1982; Baxter & Thompson, 2002). Research suggests that influencing a child to accept and/or prefer an unfamiliar or relatively disliked food may be achieved by providing opportunities for repeated

tasting or exposure to the food (Birch, McPhee, Shoba, Pirok & Steinberg, 1987; Birch & Marlin, 1982, Sullivan & Birch, 1990). This evidence suggests that interventions based on repeated exposure to unfamiliar foods may positively influence children to taste, develop a preference for and consume these foods.

1.7.1 Exposure and Reward: Effects on Children's Liking and Consumption of an Unfamiliar Vegetable at School

In comparison to a reward based approach, where children are offered a reward for consuming a healthy food, the exposure based approach has been found to be significantly more effective at increasing children's preference for and consumption of an unfamiliar food. In a study conducted by Wardle, Herrera, Cooke & Gibson, (2003b), researchers evaluated the effectiveness of an exposure and a reward based intervention to increase children's acceptance of an unfamiliar vegetable compared with a no-treatment control. Using a randomized control design, children aged five to seven years from three schools were assigned to either an exposure, reward or control group. The intervention comprised of one session per day for eight days during which children in the reward group were offered a sticker for tasting the target vegetable and children in the exposure group were offered a taste of the target vegetable, without being offered a reward. Sweet red pepper was selected as the target vegetable since exploratory taste tests with this age group suggested it was comparatively novel and relatively disliked. Liking for and consumption of red pepper was assessed once before and once after the reward and exposure interventions, and after each daily intervention. Liking was assessed using a 5 point faces scale representing responses

from "I like it a lot" to "I dislike it a lot". Consumption was measured by counting the pieces of red pepper consumed.

Although the outcome of the reward condition was intermediate, Wardle et al. (2003b) found significant increases in liking and consumption among the exposure group compared with the control group. These results are consistent with previous findings (Sullivan & Birch, 1990) that highlight repeated exposure as a promising method for promoting the acceptance of unfamiliar foods. Although findings were positive, shortcomings of this study included its facilitation by an unfamiliar researcher and the lack of a long term follow up period to assess the sustainability of the positive effects. Furthermore, only children with parental consent were eligible to participate. Forty-nine (68.1%) of 72 original children participated, which is a comparatively small sample size.

1.7.2 Exposure and Knowledge: Effects on Children's Liking, Preference Ranking and Consumption of an Unfamiliar Vegetable in the Home

Building on findings from the prior study conducted by Wardle et al. (2003b), Wardle et al. (2003a) evaluated the effectiveness of an exposure based intervention on increasing children's liking for a previously disliked vegetable in a more neutral setting, the child's home. Using a randomized controlled design, 156 parents and children between the ages of two and six years were assigned to a taste exposure group, a health information group or a control group. All child participants took part in a pre and post intervention taste test whereby they were asked to taste and rate their

liking for six test vegetables. Liking was assessed using a three point faces scale representing responses of like, dislike and neutral. Consumption was measured by weighing the amount of the vegetable before and after consumption. Children were then asked to rank the six vegetables in order of preference (from 'most liked' to 'least liked'). The vegetable with a moderately low ranking of three was selected as the child's target vegetable. Each day for the following 14 days, parents offered a taste of this target vegetable to their children.

Wardle et al. (2003a) found significant increases in liking, preference ranking and consumption of the target vegetable from pre to post intervention among children in the exposure group. Although positive changes were seen in all three groups, the effect was the strongest in the exposure group. These results support previous findings that increased exposure to an unfamiliar or disliked food may increase liking (Sullivan & Birch, 1990; Wardle et al., 2003b) and consumption of that food (Wardle et al., 2003b). Furthermore, this study suggests that a parent-led exposure based intervention holds promise for overcoming the real life challenge of improving children's acceptance of vegetables in the home. Although the real world setting of this study strengthened the research findings, aspects that were difficult to control included parents' difficulties associated with scheduling the pre and post vegetable tasting assessments for the same time each day and the varying hunger levels of the children which may have influenced their decision to taste a particular vegetable. Also, as there was no long term quantitative follow up it is unclear whether any improvements to children's liking for vegetables were sustained over time.

1.7.3 Exposure: Effects on Children's Liking and Willingness to Try Unfamiliar Fruits and Vegetables at School

The effects of an exposure based intervention on increasing children's preference for an unfamiliar or previously disliked food are further demonstrated in a Canadian study conducted by Taylor, Binns, Smith, Gallant & Crozier (2003). The objectives of this study were to evaluate the impact of a Fruit and Vegetable Snack Program on elementary school children's preferences for and willingness to try fruits and vegetables. Using a pre-post study design, 379 students from grades one to six from three Prince Edward Island (PEI) elementary schools participated in a six week fruit and vegetable intervention. During the intervention, students were encouraged to sample fruits and vegetables offered to their classroom once a week at the same time each morning (before recess). Three choices of fruits or vegetables were offered each week, with each fruit and vegetable being offered twice during the program. One fruit and/or vegetable considered to be unfamiliar was included each week.

A pre-tested schematic faces questionnaire was used to evaluate the students' preferences and willingness to try the fruits and vegetables once before and once after the intervention was finished. Preference was assessed using a four point 'faces' scale representing 'yucky', 'okay', 'yummy' and 'never tried' (Birch & Sullivan, 1991; Guthrie, Rapoport & Wardle, 2000). Willingness to try was assessed using a five point 'faces' scale representing 'not willing to try' to 'very willing' (Loewen & Pliner, 1999). Trained dietetic interns and the researcher administered the pre and post questionnaires. Sample questions as well as coloured pictures of the fruits and

vegetables were copied on overheads and reviewed in the classroom with the students prior to their completion of questionnaires.

Taylor et al. (2003) found that the school children had an overall increase in liking and willingness to try the fruits and vegetables. These results are consistent with findings from Wardle et al. (2003a; 2003b) which demonstrated that an exposure to an unfamiliar vegetable increased childrens' liking and consumption of that vegetable. Although positive findings were demonstrated, the author stated that the evaluation design would be enhanced with the inclusion of controls, an extended time period of observation and increased frequency of fruit and vegetable offering.

1.7.4 Summary of Exposure Based Methodologies

Exposure based interventions studied by Wardle et al. (2003a; 2003b) and Taylor et al. (2003) were successful at increasing children's overall acceptance of unfamiliar and/or previously disliked fruits and/or vegetables. Since acceptance of a new food is a strong predictor of its consumption, exposure based interventions may be an effective method to increase the consumption of unfamiliar foods by children. The design of future exposure based interventions should consider the benefits and shortcomings of previous studies, including those conducted by Wardle et al. (2003b), Wardle et al., (2003a) and Taylor et al. (2003). Although the taste of food is a primary sensory quality influencing food preference (Anliker, Bartoshuk, Ferris & Hooks, 1991), the exposure based intervention could consider the presentation of fruits and vegetables prepared in ways that may enhance sensory qualities preferred by children

(e.g. juiciness, colour, bite-size portions) (Blanchette & Brug, 2005). These considerations coupled with the promotion of fruits and vegetables in a positive context could serve to provide a foundation to develop and implement promising interventions aimed at increasing the acceptance and consumption of fruits and vegetables by children.

1.8 The Current School Nutrition Environment

Interventions aiming to improve the health of children are increasingly being conducted within the school setting. Such interventions have the potential to reach a large number of children and are also poised to communicate a comprehensive health promotion message. The government of NL has acknowledged the increasing provincial rates of childhood overweight and obesity and is attempting to address the issue partly through a variety of school based health promotion initiatives.

1.8.1 Schools: A Good Setting for Nutrition Interventions

Schools are a popular setting in which to implement and evaluate nutrition interventions among children. In a recent best practice review of programs to address the prevention and treatment of childhood obesity and chronic disease, researchers found that school based programming positively impacted health status indicators, such as body composition, chronic disease risk factors and fitness (reviewed by Flynn et al., 2006). Children aged five years and older spend approximately six hours a day, nine to 10 months out of the year in school and can consume one to two meals a day there (Budd & Volpe, 2006). As such, the school acts as an important venue in which

to facilitate the harmonization of healthy living messages expressed in the home and in the community. As part of a comprehensive school health approach, school nutrition interventions have the potential to benefit a range of children, including those experiencing food insecurity. By modeling and reinforcing healthy nutrition behaviours these interventions can serve to enhance school children's nutritional learning, lower their risk for developing chronic diseases and contribute to lifelong health benefits (Veugelers & Fitzgerald, 2005).

1.8.2 Newfoundland and Labrador's Comprehensive School Health Approach

Comprehensive School Health refers to a multifaceted approach to health promotion in the school. It includes teaching health skills in the classroom, creating health-enabling social and physical environments and facilitating links with parents, local agencies and the wider community to support optimal health and learning (Canadian Association for School Health, 2007). Due to the rise in childhood obesity and pre-mature development of chronic disease risk factors in children and youth, comprehensive school health programs often target the contributing factors of these conditions, such as physical inactivity and poor dietary practices (Veugelers & Fitzgerald, 2005).

In NL, the provincial government has responded to high rates of childhood obesity and its associated risk factors by investing in wellness initiatives. In 2006, the government released its Provincial Wellness Plan, phase one (2006-2009) of which introduced the 'Healthy Students, Healthy Schools Initiative'. The initial priority of

this initiative was to develop policies, programs and services that support healthy eating and physical activity in schools, including the implementation of school food guidelines and the support of school food programs (Government of NL, 2006a).

1.8.3 School Food Guidelines

Surveys of nutrition programs in Atlantic Canadian schools (e.g. Nova Scotia, Prince Edward Island, New Brunswick and Newfoundland and Labrador) have identified a number of concerns regarding the availability of nutritious foods served and sold to students (Nova Scotia Department of Health, 1993; Taylor, Mather & McBride, 2002; Rankine, 1990; Coalition for School Nutrition, 2001). The government of NL has developed and implemented school food guidelines which are intended to improve the dietary behaviours of school children in NL. These guidelines outline the foods that should be served and sold in school cafeterias, canteens, vending machines and during events organized by or held in the provinces schools. The guidelines also encourage adequate time and facilities for dining, reasonable pricing for healthy foods, use of local foods and marketing of healthy eating messages to parents and care givers. Launched in the 2005-2006 school year, the school food guidelines were phased in over three years, with full implementation targeted for the fall of 2009. Financial and human resources were dedicated to ensure that education, awareness, action and sustainability of the guidelines among the school, home and community environments were coordinated and consistent (Government of NL, 2006c).

1.8.4 School Food Programs

School food and/or nutrition programs in NL such as those operated by the School Milk (SM) Foundation and Kids Eat Smart (KES) Foundation, aim to increase school childrens' access and exposure to nutritious foods, such as milk, whole grains and fruits and vegetables (Kids Eat Smart Foundation [KESF], 2009a; School Milk Foundation, 2008). Both Foundations offer children and youth nutritious food choices, model healthy eating and support nutrition education for students and volunteers. While the SM Foundation is known for supporting low milk prices in schools throughout the province, the KES Foundation is the primary supporter of breakfast, lunch and/or snack programs offered through NL schools and community centres.

Sponsorship for KES programs is provided through national partners including the Breakfast for Learning, Canadian Living Foundation and provincial partners including the government of NL. The provincial government has increased its funding for the KES Foundation from $500,000 in the 2007-2008 budget to $1,250,000 in the 2008-2009 budget (KESF, 2009b) and also offers potential further funding through its Provincial Wellness Grants program to start up new or enhance existing nutrition programs. Through such partnerships, the Foundation was able to support 193 KES Clubs (breakfast, lunch or snack programs) and more than 17,000 children (K-12) by the end of the 2008-2009 school year (KESF, 2009b).

1.8.5 Benefits of School Breakfast Programs.

Operating many of their programs as school breakfast programs, the KES Foundation offers nutritious food choices to children and youth across NL. The benefits of breakfast programs are many and are especially important to NL children and youth as they help to alleviate poor nutrition practices associated with high rates of poverty and food insecurity in the province. It has been suggested that, children who eat breakfast tend to have more adequate nutrient intakes than those who do not (Rampersaud, Pereira, Girard, Adams & Metzl, 2005). Breakfast consumption in children has also been shown to be associated with improvements in cognitive function, attention and memory (Wesnes, Pincock, Richardson, Helm & Hails, 2003). Moreover, inadequately nourished children may score lower on vocabulary, reading, comprehension, arithmetic and general knowledge tests and have poorer psychosocial outcomes (Brown & Pollitt, 1996).

Only 49% of Canadian girls and 38% of Canadian boys eat breakfast on a regular basis (Rampersaud et al., 2005). School breakfast programs serve to encourage breakfast consumption and provide the nourishment needed to support healthy growth and development. For instance, Veugelers & Fitzgerald (2005) found that grade five students from Nova Scotia schools participating in a coordinated program that incorporated recommendations for school based healthy eating programs exhibited significantly lower rates of overweight and obesity, had healthier diets and reported more physical activities than students from schools without nutrition programs.

Research is consistent in reporting that serving breakfast to school children who don't get it elsewhere, improves their nutrient intake (Rampersaud et al. 2005), academic performance (Brown & Pollitt, 1996; Wesnes et al., 2003) and can lower rates of overweight and obesity (Veugelers & Fitzgerald, 2005). However, research also suggests that healthy food habits, including the intake of fruits and vegetables, decline as children become older and the nutrition challenges increase (reviewed by Flynn et al. 2006; Guthrie et al., 2000; Statistics Canada, 2005; reviewed by Summerbell et al., 2005). Thus, nutrition interventions such as breakfast programs that target children may yield great benefits for improving the diets of children, adolescents and the overall population.

1.8.6 Exploring the Impact of the Kids Eat Smart Breakfast Programs

As part of provincial government funding, in 2006 the KES Foundation received $50,000 to support their breakfast and snack programs. Referred to as the *Fruit and Veggies First!* Initiative, the goal of this funding was to improve children's access, availability and exposure to a variety of fruits and vegetables offered through KES Foundation nutrition programs in NL (Government of NL, 2006b). However, when this initiative began, there was no way of knowing if it was having any significant effect on the school children's attitudes and/or behaviours towards the new fruits and vegetables offered to them. As such, the KES Foundation sought a partnership with Memorial University, Faculty of Medicine (the author and supervisor) to conduct a research project to explore the impact of the Fruits and Veggies First initiative on the school children.

1.9 Summary of Introduction and Literature Review

Fruit and vegetable consumption is an integral component of a healthy and nutritious diet and essential for adequate growth and development of children. Children today are consuming less than the daily recommended number of servings of fruits and vegetables. This is of concern since low fruit and vegetable consumption is associated with an increased development of chronic disease risk factors among children, including overweight and obesity. Obesity rates among children and youth have more than doubled over the past two decades. Overweight and obesity can have detrimental effects on a child's physical, social and emotional health as well as the health care system as costs are impacted by the increasing demand to treat associated conditions.

A number of individual and collective factors determine the healthy eating behaviours of children including food availability, socio-economic status and food knowledge. However, interventions aiming to increase fruit and vegetable consumption among children have found 'preference' as a primary determinant of their consumption. Furthermore, some research suggests that 'preference' for and 'willingness to try' fruits and/or vegetables increases the more a child is exposed to the fruit or vegetable. As such, interventions based upon increasing exposure may serve to improve children's willingness to try, preference for and consumption of fruits and/or vegetables. The development of future exposure based interventions should consider the benefits and shortcomings of previous research including the study design (e.g. randomized control or pre-post designs), setting (e.g. school or home), number of participants, duration of the exposure period, fruit and/or vegetable offered, research

facilitator (e.g. researcher or parent), measurements (e.g. liking, preference ranking, consumption and/or willingness to try), comparison controls, and the inclusion of a long term follow-up period.

Healthy lifestyle behaviours learned at an early age are often carried into the adolescent and adult years. As such, dietary behaviour modification interventions developed and implemented among children may serve to improve the population's diet. The school is among the chief societal factors involved in shaping children's nutritional behaviours. Furthermore, as school breakfast programs promote healthy food choices in a positive environment to a relatively large number of children, they are uniquely positioned to support research aimed at improving the healthy eating behaviours of children and youth.

CHAPTER 2

Aim of Study

2.1 Introduction

The prevalence of overweight and obesity among children in NL is significantly higher than the national average (Statistics Canada, 2005). Unhealthy lifestyle behaviours practiced at an early age establish the foundation for the development and maintenance of overweight and obesity in the adolescent and adult years (Whitlock et al., 2005). Research indicates that once obese, adults have little success returning to a healthy weight (TACP, 1993). Nutrition is considered a significant and modifiable contributor in the development of overweight and obesity (Willett et al., 2006; WHO, 2002). Since healthy dietary behaviours are established at an early age, nutrition interventions focused on modifying the dietary behaviours of children have the potential to improve the health of NL residents.

2.2 Rationale

A complexity of factors influence the dietary behaviours and food consumption patterns of children (Taylor et al, 2005). Of these factors, studies have indicated 'preference' for a specific food as a strong predictor of a child's consumption of that food (reviewed by Birch, 1999). Furthermore, there is preliminary evidence to support a popular belief that preference for a food increases with an increased frequency of exposure to that food (Wardle et al., 2003b, 2003a; Taylor et al., 2003). This suggests that interventions aiming to improve the variety and quality of children's diets may be successful if focused on improving children's food preferences. The family and school are primary environments where children avail of and become exposed to a variety of healthy foods, including fruits and vegetables. However, economic burdens and other determinants of healthy eating

experienced by NL families may limit their ability to provide and expose their children to a variety of these healthy foods.

On September 26 2006, the KES Foundation launched its *Fruits & Veggies First!* initiative with the Minister of Health and Community Services, province of NL. *Fruits & Veggies First!* was an initiative funded partly by a community grant from the Department of Health and Community Services. The KES Foundation allocated this funding to their member clubs across NL to increase fruit and vegetable offerings above what they were previously able to offer (Government of NL, 2006b). Through this initiative, the Foundation sought to improve children's access, availability and exposure to a variety of fruits and vegetables. However, they were uncertain if this initiative was having any significant effect on the attitudes and/or behaviours of the school children and whether these effects were negative or positive influences on their health status. The Foundation sought a partnership with the Division of Community Health and Humanities (Faculty of Medicine, Memorial University of Newfoundland) research team (author and supervisor) to conduct a research project to evaluate the impact of this initiative.

A recent study conducted in Prince Edward Island (Taylor et al., 2003) that evaluated the impact of a Fruit and Vegetable Snack Program on elementary school children's preferences for and willingness to try fruits and vegetables found that the school children had an overall increase in liking and willingness to try the fruits and vegetables offered. These results were particularly encouraging considering the relatively low level of exposure of one fruit and veggie snack per week for six weeks. Despite these encouraging results, Taylor et al. (2003) suggested that future research should extend the time period for observation (e.g. greater than six weeks) and increase the frequency of

snack offering. Furthermore, Taylor's study did not incorporate a comparison or control group to strengthen study findings nor a follow up period to determine if any significant changes were sustained over time.

Exposure based studies conducted by Wardle et al. (2003a; 2003b) also found some changes in children's acceptance of an unfamiliar food. However, the sample sizes of these studies were smaller than the Taylor study (N=379), having been conducted with 156 and 72 children, respectively. Furthermore, the time period for observation in these studies were eight and 14 days, respectively. Neither of these studies incorporated a follow up period. The present study sought to address the shortcomings of previous research and attempted to further research of this nature in Atlantic Canada by:

- increasing the sample size;
- increasing the timeframe for the exposure period (e.g. one weekly exposure of each fruit for a total of eight weeks);
- including a control period where students acted as their own controls;
- including control foods; and
- including a follow up period.

In partnership with the KES Foundation, this research project was designed to build on and address potential shortcomings of previous exposure based intervention studies, such as those highlighted above. Operating through their *Fruits and Veggies First!* initiative, this project could potentially provide the KES Foundation with information surrounding the practical impact of increased exposure to new or unfamiliar fruits offered to school children participating in this initiative. Data resulting from this project could be very important in establishing factors associated with increased fruit consumption in the

children. The evaluation itself could be valuable for the KES Foundation when exploring future funding opportunities to further develop their nutrition projects (see letter in support of this project from the KES Foundation in Appendix A).

2.3 Purpose and Objectives

The purpose of this study was two fold - to increase the consumption of fruits by young children which has been shown to be associated with a decreased prevalence of risk factors for overweight/obesity and overall improved health; and to evaluate an initiative of the KES Foundation as one possible route to increase the intake of fruits. The results of this study will potentially contribute to the development and sustainability of interventions aimed at increasing fruit consumption by young children.

The specific objectives of this study were:

1. To introduce and offer three new fruits to elementary students through their schools' pre-existing KES Foundation breakfast programs.
2. To assess the impact of an exposure-based intervention on elementary students' liking, willingness to try and tasting of the three new fruits.
3. To address the shortcomings of previous exposure based research and further research of this nature in Atlantic Canada.
4. To investigate possible factors which might influence school children's food intake during the school day by questioning school principals.
5. To inform the KES Foundation of the findings of this research project.

CHAPTER 3

Methodology

3.1 Introduction

The study involved working with representatives of NL's Eastern School District, provincial administrators of the KES Foundation, volunteers with the Foundation, local food suppliers and school representatives. Elementary school children were exposed to new fruits as part of their schools' pre-existing KES Foundation breakfast programs. The researchers attempted to control and monitor this fruit exposure. Data were collected via questionnaires from participating students and school principals.

3.2 Study Design

Using a within-subjects design (Munro, 2005), this study assessed the impact of an exposure based intervention on elementary students' liking, willingness to try and/or tasting of three new fruits introduced through their schools' pre-existing KES Foundation breakfast programs. This study was planned during the summer and fall of 2006. Data collection was conducted between December 2006 and June 2007 (see timeline in Appendix B).

3.2.1 School Selection

All schools with elementary students (e.g. students from Kindergarten to grade six) in the Eastern School District that operated a breakfast program supported by the KES Foundation were contacted regarding their potential interest in participating in this study (Appendix C). A number of schools showed an interest, however those with any students known to have an allergy to the fruits under investigation were not eligible to participate.

Schools were located in urban, rural or remote communities. Communities were classified as either urban, rural or remote by the KES Foundation according to their accessibility by car and food availability/selection. According to the NL Government (2005b) rurality is not only relative to population but also to the distance a location is from required services such as health care and core need services such as major grocery outlets. The KES Foundation classification system was adopted for the purpose of this research which classified urban communities as those easily accessed by car and have a wide availability/selection of food (e.g. large grocery store in area), rural communities as those easily accessed by car and have less food availability/selection than an urban area, and remote communities as those not easily accessed by car for part of the year or are only accessible by boat and have less food availability/selection than a rural area.

3.2.2 Study Population

Based on consultations with a statistician, a sample size of at least 646 students was estimated to be required to detect a difference at a 5% level of significance. Eight eligible schools were randomly selected to participate, providing a total of 740 potential student participants (e.g. 740 students availed of the schools' breakfast programs). This original sample size decreased to 700 students due to one school dropping out of the study. Seven of the eight schools completed participation in the project.

3.2.3 Questionnaire Details

Data were collected from participating students via a Student Questionnaire and from school principals via a Principal Questionnaire.

3.2.3.1 Student questionnaire.

Data were collected from students using a pre-tested questionnaire comprised of schematic 'faces', which varied in expression from a broad smile to a deep frown and were neutral with respect to sex. The reliability of this measurement scale has been demonstrated by Birch & Sullivan (1991), Guthrie et al. (2000), Wardle et al. (2003a) and Wardle et al. (2003b). The content of the questionnaires used in each of these studies varied as each assessed children's preference for different foods. The questionnaire format used in the present study was pretested and used as part of a study conducted in Prince Edward Island (PEI) by Taylor et al. (2003) (see questionnaire in Appendix D). Permission to adopt this questionnaire format was obtained from Dr. Taylor (Appendix E).

Each questionnaire contained one picture of the food under investigation. The survey monitored six foods in all, three control foods which were never offered to the students in the study and three test foods. Each questionnaire contained two questions for each of the six foods under investigation. The first question was designed to assess each student's liking of the food by asking the question "How much do you like this food?" Potential responses were illustrated by a three point 'faces' scale graded as 1 = yucky, 2 = just ok, and 3 = yummy (Birch & Sullivan, 1991; Guthrie et al., 2000). Students could also select an 'X' (graded as 999) indicating a response of 'never tried'. The second question assessed the student's willingness to try the food by asking the question "How much are you willing to try this food?" Potential responses were illustrated by a five point 'faces' scale graded as 1 = really don't want to try it, 2 = sort of don't want to try it, 3 = in

between, so-so, don't care, 4 = sort of want to try it, and 5 = really want to try it (Loewen & Pliner, 1999).

3.2.3.2 Principal questionnaire.

Data were collected from principals of participating schools using a self-administered questionnaire that included all closed ended questions (Appendix F). Based on a review of the literature and information of interest to the KES Foundation, this questionnaire was developed specifically for this investigation to collect information about factors potentially associated with the students' food choices at school, the estimated change in the number of students participating in the breakfast program over the duration of our research project and the estimated change in fruit consumption before versus after the research intervention. The questionnaire also asked the principals to indicate the average monetary intake by their school's canteen and/or cafeteria from the sale of candy items per day. Candy items were defined as 'any soft or hard candies including chocolate bars, chewing gum and/or fruit leathers and excluding salty snacks such as potato chips, dessert/baked goods and/or soft drinks' (Government of NL, 2006e; United States Department of Agriculture, 2006).

This questionnaire was pre-tested by a small group of educators before being distributed to school principals. Principals were sent an electronic copy of the Principal Questionnaire at the beginning of the study. Instructions were provided to work with the school breakfast program coordinator to complete the questions and to return the

completed questionnaire at the end of the study. The research team was also available to assist in questionnaire completion.

3.2.4 Study Logistics

This section describes the logistics of the study including its facilitation, the selection, preparation and presentation of the test fruits, food supplier involvement, details surrounding the study materials, and parental/guardian consent.

3.2.4.1 Study facilitation.

This study was facilitated at each participating school by the school's breakfast program coordinator (e.g. teacher and/or volunteer) and the principal. Program coordinator responsibilities associated with this project included the administration of the student questionnaires, the coordination of preparation, presentation and offering of the test fruits to participating students according to the research protocol, and assisting the principals to complete the Principal Questionnaire. Principal responsibilities included consulting with the program coordinators to complete the Principal Questionnaire, supporting the administration of the study within their school and keeping in contact with the researchers to inform them of the project's progress.

A study time line was provided to all participating school principals and program coordinators (Appendix B). A teleconference was held with principals, program coordinators, KES Foundation representatives and the researchers (author and supervisor) prior to each administration of the student questionnaires (i.e. four in total) to ensure the consistency of activities at each of the schools. The researchers contacted the school

principals and program coordinators more frequently by telephone and email periodically throughout the duration of the study to ensure that everyone understood the process being followed. Principals and coordinators were also provided with contact information for the researchers and were encouraged to call anytime.

3.2.4.2 Test fruits and control foods.

Previous exposure based research has incorporated a combination of both fruits and vegetables as test foods (Taylor et al. 2003). The test foods in the present study were being offered as part of a pre-existing breakfast program. As such, fruits were chosen as the test foods due to their acceptability as breakfast foods with the target population. Kiwifruit, cantaloupe and green seedless grapes were chosen as the test fruits for this study. Cantaloupe and grapes were previously used in the PEI project conducted by Taylor et al. (2003). Taylor's study suggested that these fruits should be relatively unfamiliar to students from the participating schools (rural Atlantic Canada). Consideration was also given to the availability of these fruits during the intervention period in rural and urban NL and the cost from local food suppliers.

Starfruit, ice cream and earth worms were chosen as the control foods for this study. Three different controls were chosen in an attempt to strengthen the findings of this study. Starfruit was considered to be unfamiliar to the participants due to its limited availability, ice cream was considered to be familiar and favourable to most students, and earth worms were considered to be an inedible food and one which the children would have never tried or be willing to try. Foods were chosen as controls versus fruits as it was difficult to identify fruits that reflected each of these categories. For instance, since most

schools were located in rural communities, it was challenging to identify a fruit that would be considered familiar and favorable to most students due to issues such as accessibility to and availability of a variety of fruits.

Program coordinators at each school were given specific instructions on how to prepare, present and offer the test fruits to the students availing of the breakfast program. *Eating Well with Canada's Food Guide* was consulted to determine the size of one child's fruit serving. Coordinators were provided a picture of one fruit serving for each of the test fruits (Appendix G) which was to be used as a guide when preparing and presenting the test fruits. Coordinators were instructed to offer students' only one serving of the test fruits. Students could be offered seconds if there were any fruits left over. Preparation and presentation instructions were as follows:

- Cantaloupe: Wash the whole cantaloupe (Do not peel). Cut the whole cantaloupe in half. Using a spoon, remove the seeds inside each cantaloupe half. Cut each cantaloupe half in two – you should now have 4 large wedges. Continue cutting these wedges lengthwise until you have a total of 16 wedges (e.g. ¼ cup or 1 child's fruit serving). Present each wedge in a plastic bowl or on a napkin.
- Green Seedless Grapes: Wash the grapes well. Remove grapes from their stem. Place 10-12 grapes (e.g. ¼ cup or 1 child's fruit serving) in a bowl or plastic baggie. Offer the grapes with a napkin.
- Kiwifruit: Wash the whole kiwifruit (Do not peel). Cut each kiwifruit in half (e.g. ¼ cup or 1 child's fruit serving). Offer with a napkin and plastic spoon.

3.2.4.3 Food suppliers.

Breakfast program coordinators provided the researchers with the name of the food supplier from whom they typically purchased food for the breakfast program. Each of these food suppliers was contacted directly by the researchers to ensure that each of the test fruits would be available to all of the participating schools during the intervention period, February and March of 2007. Suppliers signed a form indicating their understanding of the project and agreement to supply these fruits to the respective school during the time period (Appendix H). Program coordinators were instructed to contact the supplier each week to indicate the estimated amount of the test fruits required for the following week's breakfast program, as suppliers needed an approximate number to forecast how much of the fruits they would need to have in storage.

3.2.5 Study Materials

Principals were emailed a copy of the Principal Questionnaire at the beginning of the study and were asked to have it completed and returned at the end of the study. They were sent periodic reminders to collect the data necessary to complete this survey. Blank student questionnaires were photocopied at the KES Foundation office and mailed to each of the participating schools prior to each of the administration dates. Schools were responsible for mailing all completed student questionnaires back to the KES Foundation, costs of which were reimbursed by the Foundation.

3.2.6 Consent

Information letters describing this study, its purpose and the process were sent to the Eastern School District Board, principals, program coordinators, teachers and volunteers

and home with all students in the participating schools. The school board verbally confirmed permission to conduct this research upon receipt of a letter sent by the KES Foundation and researchers requesting permission to do so (Appendix I). As per school board policy, an application for permission to conduct research in the participating schools was subsequently completed by the researchers. A signed letter granting permission to conduct this research in the participating schools was then provided by the Eastern School District (Appendix P). As well, participating school principals and program coordinators each signed a form indicating their willingness to participate in this study (Appendices J and K). See Appendix L for the information letter sent to teachers and volunteers.

The school board requested that signed consent be obtained from parents/guardians of all participating school children (see parental/guardian consent form in Appendix M). Principals were sent an electronic copy of this consent form, which was subsequently placed on each school's letter head, photocopied at the school and sent home with each child from Kindergarten to grade six. The parental/guardian consent form was reviewed and approved for distribution by the school board, Memorial University's Human Investigations Committee, the KES Foundation and the participating school principals. Literacy level of parents/guardians, readability of the form and inclusion of all necessary research information were considerations in its review. This consent form was considered to be similar in readability to other letters sent home to parent/guardians notifying them of school and student activities. The school principals, breakfast program

coordinators and parents were sent a number of reminders to encourage student participation and the return of parental/guardian consent forms.

Despite the parents' decision to allow participation, students were informed on the day of the survey administration that it is was up to them to complete the survey or not. If they did not wish to participate they were instructed by program coordinators to leave the survey blank. Students were also assured that their grades would not be affected whether they participated or not. Program coordinators were instructed to use the student attendance form to track students from whom a parental/guardian consent form was received indicating their ability to participate.

3.3 Intervention Description

This study was conducted during a 26 consecutive week period which included an initial control period of eight weeks, followed by an intervention period of eight weeks and concluding with a follow up period of 10 weeks. It was conducted through the school's pre-existing breakfast program which was a 'real world' setting in which the students were accustomed to consuming snacks and/or meals.

At time 0 (January, 2007) the eight week control period began. Students acted as their own controls and were asked by the program coordinator to complete a set of six pre-tested questionnaires, each containing two questions assessing the students' liking and willingness to try one of the three test fruits (kiwifruit, cantaloupe and green seedless grapes) or one of three control foods (ice cream, star fruit and earth worms) (Appendix D). The student questionnaires and a script outlining how to administer the questionnaires

were mailed to the program coordinators on four separate occasions prior to their administration date (see student questionnaire script in Appendix N). Sample questionnaires including coloured pictures of the test fruits and control foods, were copied on plastic projector overheads and reviewed in the classroom with the students prior to and as they were completing the questionnaires. This was intended to provide guidance in terms of how to complete the questionnaires, support the students' comprehension of the questions, and ensure that they could accurately identify the test fruits and control foods. None of the test fruits were offered by the school during the eight week control period.

Students were assigned a unique identifier code to enable the researcher to match all questionnaires completed by an individual student. This method was previously used in the PEI study by Taylor et al. (2003). This code consisted of the student's initials (e.g. John James Doe would be JJD), his/her age (e.g. 7), sex ('B' for boy or 'G' for girl) and the first letter of their mother's first name (e.g. J for Joan). The code in this example would be JJD 7BJ. The children were instructed to write this code at the top of the questionnaire. If a code was missing from a questionnaire, it could not be matched to other questionnaires and was not used in the dataset.

Time 1 marked the end of the control period and the beginning of the eight week intervention period. One day before the intervention was to begin, students were asked to complete the same questionnaires again (e.g. indicating their 'liking' and 'willingness to try' each test fruit and control food). This was followed by a period in which the students

were offered each of the test fruits once per week for eight consecutive weeks (e.g. a total of eight exposures per fruit). All schools offered the test fruit at the same time each day, prior to the start of morning classes (e.g. breakfast time). Similarly, all students were encouraged by the program coordinator to try the fruits offered. Students could choose to consume these fruits when offered but were never required to consume them. Coordinators were asked to not offer any other fruits as part of the breakfast program on the day the test fruits were being offered. Since the test fruits were being offered as part of each school's pre-existing breakfast program, other breakfast foods (e.g. toast, juice, etc.) may have been offered in addition to the test fruits. The test fruits were not offered on any other day other than the test day of the breakfast program.

Time 2 marked the end of the intervention period and the beginning of the ten week follow-up period. A day after the fruit intervention ended (e.g. kiwifruit, cantaloupe and green grapes were no longer offered as part of the breakfast program) students were asked to complete the same questionnaires again (e.g. indicating their 'liking' and 'willingness to try' each test and control food).

Time 3 marked the end of the follow up period. Although regular school breakfast continued to be offered through the KES Foundation to the students, all schools agreed not to offer the test fruits as part of their breakfast program during this time period. Ten weeks after the intervention had ended, students were asked to complete the same questionnaires again. This set of questionnaires acted as a follow up to assess whether

possible intervention effects were sustained or partially sustained with time without exposure to the fruits.

3.4 Improving Response Rates

Due to the Eastern School District policy, written parental/guardian consent was required for students to participate in the present study. Essentially, students from Kindergarten to grade six were instructed to bring the parental/guardian consent form home, have their parents/guardians sign it and then return it to school. Considering this process, issues with no response were anticipated. Many attempts to increase the response rate of student participants were made. Parental/guardian consent forms were distributed to potential student participants by the school before the study began. In all schools, reminders were sent out after the consent forms were sent home but before all were signed and returned to school. Some schools even sent blank consent forms home a second time to parents/guardians from whom a signed consent form had not been received in the first attempt. Researchers made multiple contacts to participating schools by teleconference, personal telephone calls and e-mail to remind project coordinators to encourage student participation and to return parental/guardian consent forms. Program coordinators were asked to encourage every student who had consent to participate in the research project to complete the questionnaires.

3.5 Data Analysis

All data from the student questionnaires with a matching parental consent form were entered into the Statistical Package for the Social Sciences (SPSS) Version 16.0. Data

from surveys completed by student participants at times 0, 1, 2 and 3 were analyzed. Only data from students from whom a signed parental/guardian consent form was received and who completed questionnaires at all four time periods were analyzed. Responses to the Principal Questionnaire were summarized and presented as tables and figures using Microsoft Excel 2003. Some numerical responses were converted into percentages, however no statistical analyses was performed on data from the Principal Questionnaire.

3.5.1 Program and School Description

Descriptive data of the KES Foundation and the schools which operated a breakfast program were obtained from the KES Foundation administrative office as per the 2006-2007 school year. These data were entered into tables using Microsoft Excel 2003, and were subsequently summarized and converted into percentages. No statistical analysis was performed on these data.

3.5.2 Student response rate and student description.

The student response rate was determined by dividing the number of parental/guardian consent forms received by the total number of parental/guardian consent forms distributed. The total number of parental/guardian consent forms distributed is reflective of the total number of elementary students enrolled in grades Kindergarten to six in all of the participating schools. Elementary student enrollment data were received from the Eastern School District as per the 2006-2007 school year. Descriptive data of the student

participants were analyzed using SPSS. This analysis included conducting frequency counts of the categorical variables, sex and grade/age group.

3.5.3 Control Foods and Test Fruits: Variable Analysis.

SPSS version 16 was used to run descriptive statistics of the variables 'liking' for the three test fruits and three control foods and 'willingness to try' for the three test fruits at the four survey administration times (e.g. time 0, 1, 2 and 3). Descriptive statistics included frequencies, mean scores and standard deviations. The mean score for the variable 'like' was considered to be the 'liking score'. Similarly, the mean score of the variable 'willingness to try' was considered to be the 'willingness to try score' (Taylor et al. 2003).

3.5.3.1 Change in " liking" and "willingness to try" scores.

The variables 'liking' and 'willingness to try' were measured using three and five point Likert scales, respectively. Both are considered ordinal (categorical) levels of measurement (Pallent, 2007). Non-parametric tests, including the Friedman matched samples test and the Wilcoxon signed rank test are appropriate to analyze these type of data and also when participants serve as their own controls (Munro, 2005), as was the case in the present study.

A Friedman matched samples test was first performed to determine if there were any statistically significant changes in 'liking' scores for the three test fruits and three control foods across the three time periods (e.g. control - 'time 0 to time 1'; intervention - 'time 1

to time 2'; and follow up - 'time 2 to time 3'). The same test was conducted to determine if there were any significant changes in students' 'willingness to try' scores for the three test fruits across the three time periods. A p value of ≤ 0.05 was considered significant.

Pending a statistically significant result using the Friedman test, a Wilcoxon signed rank test was conducted to determine the time period during which the significant change occurred (Pallant, 2007). Using the Bonferroni correction (e.g. 0.05/number of pair wise cases) to determine the p value (Munro, 2005), a Wilcoxon test may have been conducted on any one or all of the following pairwise contrasts:

- Time 0 and time 1 (control period);
- Time 1 and time 2 (intervention period); and/or
- Time 2 and time 3 (follow up period).

3.5.3.2 Percent of students indicting "liking" and "willingness to try".

The percentage of students who 'liked' and were 'willing to try' the test fruits with time was determined next. A test fruit was considered to be 'liked' when the student responded 'yummy' (graded 3 on a 3 point scale) to the question "how much do you like this fruit?" (Appendix D). This is consistent with the definition of 'liking' in the study conducted by Taylor, et al. (2003). A student was considered to be 'willing to try' the test fruits when they responded 'sort of want to try it' or 'really want to try' (graded 4 and 5 on a 5-point scale) to the question "how much are you willing to try this fruit?" (Appendix D).

Frequency counts of the number of students responding to these questions for each test fruit at time 0, 1, 2 and 3 were generated using SPSS. The percentage of students who 'liked' the test fruits was calculated by adding the total number of students responding 'yummy' and dividing this number by the total number of students who responded 'yucky', 'just ok' and 'yummy'(graded 1 to 3 on a three point scale), indicating they had tasted the test fruit. This result was converted into a percentage to reflect the percentage of students who liked the test fruits at different times. The percentage of students 'willing to try' the test fruits was calculated using the same procedure (e.g. adding the total number of students who responded 'sort of want to try it' and 'really want to try it' and dividing this by the total number of students who responded 'really don't want to try it', 'sort of don't want to try it', 'in between, so-so, don't care', 'sort of want to try it' and 'really want to try it', graded 1 to 5 on a five point scale). This result was also converted into a percentage to reflect the percentage of students who were willing to try the test fruits with time.

3.5.3.3 Tasting.

In an attempt to measure 'willingness to try' a fruit without having to depend upon the students' interpretations of their own willingness to try, an assumption was made that if a child actually tried/tasted a fruit then he/she was willing to taste it. However, if he/she did not try the food then he/she was not willing to taste it. Therefore actual tasting of the test fruits by children was approximated. Actual tasting was represented by the number of students choosing 'yucky', 'just ok' or 'yummy' in response to the question "How much do you like this fruit?" Those who did not taste the food were taken to be those who

alternatively chose 'never tried' to the same question. Although this would provide an objective measure, it is based upon the assumption that this is true.

Frequency counts of the number of students responding to the question 'How much do you like this fruit?" were generated using SPSS. The percentage of students who tasted the test fruits was calculated by adding the total number of students who responded 'yucky' 'just ok' and 'yummy' and dividing this by the total number of students who responded to this question. This result was converted into a percentage to reflect the percentage of students tasting the test fruits at different times. This analysis was then repeated for the control foods.

3.6 Ethical Considerations

The present study including the student questionnaires, principal surveys, a number of information letters, and consent forms were reviewed and approved by the Human Investigations Committee (HIC), Faculty of Medicine, Memorial University of Newfoundland. Approval from HIC is included in Appendix O. An application for permission to conduct research in the participating schools was reviewed and approved by the Eastern School District (see school district approval letter in Appendix P), as per school board policy. The author signed an *Oath of Confidentiality* and a *Preservation of Confidentiality Statement* (Appendix Q) prior to the commencement of this study.

CHAPTER 4

Results

4.1 Introduction

The following chapter presents the results of this study which include descriptions of the Kids Eat Smart (KES) Foundation nutrition programs and of the participating schools and students. An estimated response rate is provided. Data obtained from the Students' Questionnaires and Principals' Questionnaires, are summated and presented in tables and figures.

4.2 Program Description

A description of the nutrition programs operated by the KES Foundation is presented in Table 1. The Foundation operated a total of 160 nutrition programs within the four Newfoundland and Labrador (NL) school districts in the 2006-2007 school year. Nutrition programs were most often operated in schools however, the Foundation also supports community centres with an academic component that wish to operate a nutrition program. During the 2006-2007 school year, the KES Foundation served approximately 44,806 NL students through 127 breakfast programs (79%), 30 snack programs (20%) and three lunch programs (1%) (Table 1).

4.3 School Descriptions

A description of the schools participating in the present study is presented in Table 2. All schools were located within the Eastern School District. Six of the seven schools were all grade (e.g. K-12) and one was elementary (e.g. grades K-4). Of the seven schools that participated in this study, seven hundred students or 41% of the total student enrolment (N= 1729; 100%) participated in their school's breakfast program, at least periodically (Table 2).

Table 1

Description of Kids Eat Smart Foundation of NL School Nutrition Programs (2006-2007)[a]

School District[b]	Program Type			Program Location			Students Participating in KESF Programs[d] # (%)[e]	Total Student Enrolment[f] # (%)[g]
	# Breakfast	# Snack	# Lunch	# Urban[c]	# Rural[c]	# Remote[c]		
1	6	8	1	0	0	15	2,344 (49)	4,820 (11)
2	48	10	0	26	18	14	4,408 (34)	13,127 (29)
3	25	7	0	10	16	6	3,199 (48)	6,644 (15)
4	48	5	2	40	15	0	6,426 (32)	20,215 (45)
Provincial Totals	**127 (79%)**	**30 (20%)**	**3 (1%)**	**76 (48%)**	**49 (30%)**	**35 (22%)**	**16,377 (37%)**	**44,806 (100%)**
	160 (100%)			**160 (100%)**				

a Data received from the NL KESF administrative office.
b School districts within NL. The Labrador School District is represented by 1, the Western School District by 2, the Nova Central School District by 3 and the Eastern School District by 4
c KES classifications of urban, rural and remote include: Urban = Major NL centres that can be easily accessed by car and have wide food availability; Rural = NL centres that are easily accessed by car but have less food availability/selection than an urban area; Remote = NL centres that are not easily accessed by car for at least part of the year and have less food availability/selection than remote areas.
d Average number of students participating in the KESF programs (numbers may vary daily).
e Percent of total student enrollment
f Includes students from Kindergarten to grade 12
g Percent of total provincial student enrollment

Table 2

Description of Participating Schools[a]

School [b]	Grade Level	Program Type	School and Program Location	Students Participating in KESF[c] Breakfast Program # (%)[d]	Total Student Enrolment (#)
1	K-12	Breakfast	Rural[e]	200 (59.7)	335
2	K-12	Breakfast	Rural	100 (55.3)	181
3	K-4	Breakfast	Urban[f]	70 (17.1)	409
4	K-12	Breakfast	Rural	55 (44.4)	124
5	K-12	Breakfast	Urban	135 (37.5)	360
6	K-12	Breakfast	Rural	80 (51)	157
7	K-12	Breakfast	Rural	60 (36.8)	163
Total (#)				**700 (41%)**	**1729 (100%)**

a Data received from the NL KESF administrative office for the 2006-2007 school year
b Schools were randomly selected from the Eastern School District. One school discontinued participation during the study.
c KESF = Kids Eat Smart Foundation
d % refers to percentage of total school enrolment.
e NL centres that are easily accessed by car but have less food availability/selection than an urban area
f Major NL centres that can be easily accessed by car and have wide food availability

4.4 Student Response Rate

Parental/guardian consent forms were distributed to all elementary school aged children (N=1002; 100%) enrolled in each of the seven participating schools (Table 3). Of this number, 571 (57%) of the consent forms were returned, indicating the number of students who were eligible to participate in this study. Table 3 indicates that 325 students completed the questionnaires at all four administration times. This was approximately 57% of all students whose parent/guardian had returned a signed consent form to the school allowing the child/children in question to participate (325 of 571) and 32% of the total number of potential student participants (325 of 1002).

4.5 Student Description

A description of the students participating in this study is presented in Table 4. The sex and grade (age group) of the 571 student participants from the seven participating schools were compared to the total number of children residing in NL, as indicated by 2006 Canadian census data, province of Newfoundland and Labrador (Government of NL, 2006d).

Of the 571 respondents, 51% were male and 49% were female students, representing a ratio of 1.05:1 (Table 4). This ratio is representative of the overall provincial population where in 2006 the ratio of male to female children residing in NL was 1.05:1.00 (Government of NL, 2006d). A greater percentage (55%) of Kindergarten to grade three students (aged 5-8 years) participated in the present study compared to those in grades four to six (aged 9-12 years) (45%), representing a ratio of 1.2:1 (Table 4). In comparison, the overall ratio of children in Kindergarten to grade three (aged 5-8 years) to those in grades four to six (aged 9-12 years) in

Table 3

Response Rates

School	Total # Parental/Guardian Consent Forms Distributed[a]	# Signed Parental/Guardian Consent Forms Returned[b] (% of total distributed)	Students with a Full Set of Matched Questionnaires[c]	
			Yes	No
1	142	123 (87)	89 (72%)	34 (28%)
2	70	44 (63)	34 (77%)	10 (23%)
3	406	82 (20)	14 (17%)	68 (83%)
4	62	30 (48)	7 (23%)	23 (77%)
5	181	169 (93)	137 (81%)	32 (19%)
6	77	65 (84)	43 (66%)	22 (34%)
7	64	58 (91)	1 (2%)	57 (98%)
Total # (%)	**1002 (100%)**	**571 (57%)**	**325 (57%)[d] ; (32%)[e]**	**246 (43%)[f]**

a Parental/guardian consent forms distributed to all elementary students only (e.g. Kindergarten to grade six). These numbers reflect the total number of elementary students enrolled per school.
b As required by the Eastern School District policy, parental/guardian consent was required for student participation in this study. Student's from whom a parental/guardian consent form was not received, were not eligible to participate.
c Student questionnaire identifier codes (e.g. John James Doe would be JJD) matched at time 0, time1, time 2 and time 3
d % of total number of signed parental/guardian consent forms (325 of 571)
e % of total number of parental/guardian consent forms distributed (325 of 1002)
f % of total number of signed parental/guardian consent forms (246 of 571)

Table 4

Description of Student Participants

Variable		Children Residing in the province of NL[b]		Children Participating in Study[c]	
		#	%	#	%
Sex	Males	22,025	51	291	51
	Females	20,965	49	276	49
	Males: Females	1.05:1		1.05:1	
	Total (Males and females)	**42,990**	100	567[d]	100
Grade[a]	K-3	20,480	48	306	55
	4-6	22,515	52	254	45
	K-3:4-6	0.9: 1		1.2: 1	
	Total (K-6)	**42,995**	100	560[d]	100

a Grades K-3 representative of children aged 5-8 years; grades 4-6 representative of children 9-12 years
b Retrieved from the 2006 NL Census (Government of NL, 2006d)
c n=571
d Some sex and age codes were missing from student questionnaires.

the province was 0.9:1 (Government of NL, 2006d). Although the ratio of male to female children in the sample selected closely represented that ratio in the overall province, the younger children were likely over represented.

4.6 Control Foods

A Friedman matched samples test was conducted on the dataset to determine if there was a statistically significant difference in 'liking' scores for the control foods (e.g. star fruit, ice cream and earth worms) across the three time periods (e.g. control, intervention and follow up periods). Results of this test are illustrated in Table 5 and indicate there was no significant difference in 'liking' scores for starfruit, X^2 [(3, n=11) = 3.00, $p < 0.392$] and ice cream X^2 [3, n = 312) = 5.78, $p < 0.123$]. However, a significant difference in 'liking' scores was found for earth worms using this test, X^2 [(3, n=20) = 8.71, $p < 0.033$].

This significant finding was followed up with a Wilcoxon signed rank test to determine the time period in which the significant change in liking for earth worms occurred. The revised alpha level for determining statistical significance was 0.0167 (0.05/3). Table 6 presents results of this test which revealed no statistically significant difference in 'liking' scores for earth worms during the control ($z = -0.703$, $p < 0.482$), intervention ($z = -0.347$, $p < 0.729$) or follow up periods ($z = -0.276$, $p < 0.783$).

Table 5

Control Foods - Change in Liking Scores with Time, as Reported by the Student Questionnaire (results of the Friedman Matched Samples Test)

Test Fruit	n (%)[a]	Time	Liking Score[b]	SD[c]	p value[d]
Star Fruit	11 (3)	Time 0	2.64	0.809	0.392
		Time 1	2.55	0.820	
		Time 2	2.64	0.809	
		Time 3	2.55	0.820	
Ice Cream	312 (96)	Time 0	2.97	0.177	0.123
		Time 1	2.94	0.277	
		Time 2	2.96	0.201	
		Time 3	2.96	0.250	
Earth Worms	20 (6)	Time 0	1.65	0.933	0.033*
		Time 1	1.90	0.968	
		Time 2	1.90	0.968	
		Time 3	2.10	1.021	

a Represents the number and percent of students who answered the question "how much do you like this food?" at all four time periods (N=325; 100%)
b Liking score = mean; measured using a three point scale where 1='yucky', 2='ok' and 3= 'yummy'
c SD = Standard deviation of the mean
d p $\leq$0.05 is taken to be significant; * indicates significance

Table 6

Earth Worms - Change in Liking Scores with Time, as Reported by the Student Questionnaire (results of the Wilcoxon Signed Rank Test)

Test Fruit		Liking (Control period)[a]	Liking (Intervention period)[a]	Liking (Follow-up period)[a]
Earth Worms	Z [b]	-0.703 [c]	-0.347 [d]	-0.276 [d]
	P value [e]	0.482	0.729	0.783

a Control period (time 0 to time 1); Intervention period (time 1 to time 2); Follow up period (time 2 to time 3)
b Test statistic
c Based on negative ranks (number of students not willing to try earth worms at the end of the time period
d Based on positive ranks (number of students willing to try earth worms at the end of the time period)
e p Value $\leq$ 0.0167 (Bonferroni correction = 0.05/3) is taken as significant; * indicates significance

4.7 Test Fruits

Students were asked to indicate their 'liking' and 'willingness to try' three test fruits (e.g. kiwifruit, cantaloupe and green seedless grapes) at four different time periods. Results of the analysis conducted on the students' responses to these questions are presented in Table 7 and Figure 1.

4.7.1 Liking

A Friedman matched samples test was conducted on the dataset to determine if there was a statistically significant difference in 'liking' scores across the three time periods (e.g. control, intervention and follow up periods). Results of this test indicate there was no statistically significant difference in students' 'liking' scores for kiwifruit, X^2 [(3, n=208) = 2.89, p < 0.409], green seedless grapes X^2 [(3, n=288) = 4.15, p < 0.246], or cantaloupe X^2 [(3, n=131) = 4.16, p < 0.245] with time.

Figure 1 illustrates the percent of students who liked the test fruits with time. A test fruit was considered to be liked if the student responded 'yummy' to the question 'how much do you like this fruit?' Over 75% of students indicated that they liked kiwifruit and green seedless grapes at the beginning of the study (time 0).

Table 7

Test Fruits - Change in Liking Scores with Time, as Reported by the Student Questionnaire (results of the Friedman Matched Samples Test)

Test Fruits	n (%)[a]	Time	Mean (Liking Scores)[b]	SD[c]	p value[d]
		Time 0	2.73	0.587	
		Time 1	2.72	0.583	
		Time 2	2.78	0.529	
Kiwi Fruit	208	Time 3	2.72	0.589	0.409
		Time 0	2.53	0.671	
		Time 1	2.52	0.694	
		Time 2	2.63	0.659	
Cantaloupe	131	Time 3	2.58	0.679	0.245
		Time 0	2.89	0.385	
		Time 1	2.91	0.336	
		Time 2	2.93	0.311	
Grapes	288	Time 3	2.90	0.368	0.246

a Represents the number and percent of students who answered the question "how much do you like this food?" at all four time periods (N=325; 100%).
b Liking score = mean; measured using a three point scale where 1='yucky', 2='ok' and 3= 'yummy'
c SD = Standard deviation of the mean
d p $\leq$0.05 is taken to be significant; * indicates significance

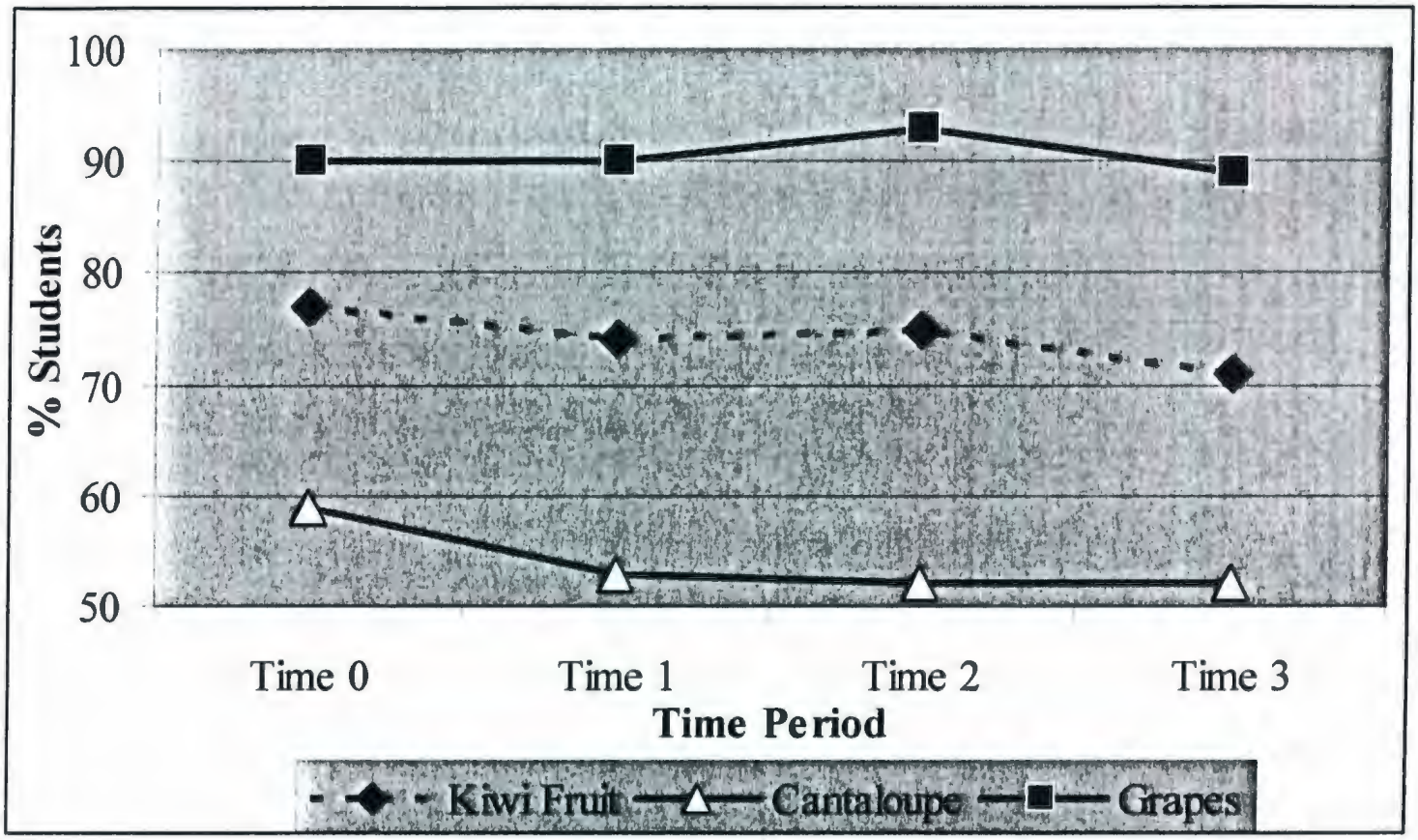

Figure 1. Percent of Students[a] who Liked[b] the Test Fruits with Time[c]

a N varied with time depending on whether the student completed the question "How much do you like this fruit?"
b Calculated by dividing the total number of students responding 'yummy' by the total number of students who responded 'yucky', 'just ok' and 'yummy'(graded 1 to 3 on a three point scale).
c Time 0 to time 1 = control period; time 1 to time 2 = intervention period; time 2 to time 3 = follow up period.

4.7.2 Willingness to Try

A Friedman matched samples test was conducted to determine if there was any significant difference in 'willingness to try' scores for the test fruits across the three time periods (e.g. control, intervention and follow up periods). Results of this test are presented in Table 8 and indicated no difference in 'willingness to try' scores for cantaloupe X^2 [(3, n=285) = 0.874, p < 0.832]. However, a significant difference in 'willingness to try' scores was found for kiwifruit, X^2 [(3, n=283) = 8.77, p < 0.032] and green seedless grapes X^2 [(3, n=275) = 95.6, p < 0.0001] using this test.

A Wilcoxon signed rank test was used to determine the time period in which the significant change in willingness to try kiwifruit and green seedless grapes occurred. Willingness to try scores for both fruits were compared at time 0 and time 1 (control period), time 1 and time 2 (intervention period), and time 2 and time 3 (follow up period) using a p value of 0.0167 (0.05/3). The Wilcoxon test results are presented in Table 9 and reveal no statistically significant difference in 'willingness to try' scores for kiwifruit during the control (z = -0.349, p < 0.727), intervention (z = -1.50, p < 0.133) or follow up periods (z = -.0432, p < 0.666). Similarly, no statistically significant difference in 'willingness to try' scores for grapes was found during the control (z = -0.817, p < 0.414) or intervention periods (z = -0.130, p < 0.896). However, there was a significant decrease in 'willingness to try' scores for grapes during the follow up period (z = -6.687, p < 0001).

Figure 2 illustrates the percent of students who were 'willing to try' the test fruits with time. A student was considered to be 'willing to try' a test fruit when they responded 'sort of want to

Table 8

Test Fruits - Change in Willingness to Try Scores with Time, as Reported by the Student Questionnaire (results of the Friedman Matched Samples Test)

Test Fruits	n (%)[a]	Time	Mean (Willingness to Try Scores)[b]	SD[c]	p value[d]
		Time 0	4.24	1.328	
		Time 1	4.25	1.341	
		Time 2	4.13	1.442	
Kiwi Fruit	283 (87)	Time 3	4.10	1.422	0.032*
		Time 0	3.59	1.613	
		Time 1	3.55	1.621	
		Time 2	3.44	1.734	
Cantaloupe	285 (88)	Time 3	3.49	1.709	0.832
		Time 0	4.77	0.736	
		Time 1	4.71	0.834	
		Time 2	4.70	0.854	
Grapes	275 (85)	Time 3	4.09	1.419	0.0001*

a Percent of students who answered the question "how much do you like this food?" with time of the total number of students who completed surveys at all four time periods (N= 325; 100%).
b Five point scale where 1 = really don't want to try it, 2 = sort of don't want to try it, 3 = in between, so-so, don't care, 4 = sort of want to try it, and 5 = really want to try it
c SD = Standard Deviation
d p Value ≤ 0.05 is taken to be significant; * indicates significance

Table 9

Kiwifruit and Green Seedless Grapes - Change in Willingness to Try Scores with Time, as Reported by the Student Questionnaire (results of the Wilcoxon Signed Rank Test)

Test Fruit		Willingness to Try (Control period)[a]	Willingness to Try (Intervention period)[a]	Willingness to Try (Follow-up period)[a]
Kiwifruit	Z[b]	-0.349[d]	-1.503[c]	-0.432[c]
	p value[e]	0.727	0.133	0.666
Grapes	Z[b]	-0.817[c]	-0.13[c]	-6.687[c]
	p value[e]	0.414	0.896	0.0001*

a Control period (time 0 to time 1); Intervention period (time 1 to time 2); Follow up period (time 2 to time 3).
b Test statistic
c Based on positive ranks (# of students willing to try the fruit at the end of the time period)
d Based on negative ranks (# of students not willing to try the fruit at the end of the time period)
e p Value $\leq$ 0.0167 (Bonferroni correction) is taken as significant; * indicates significance

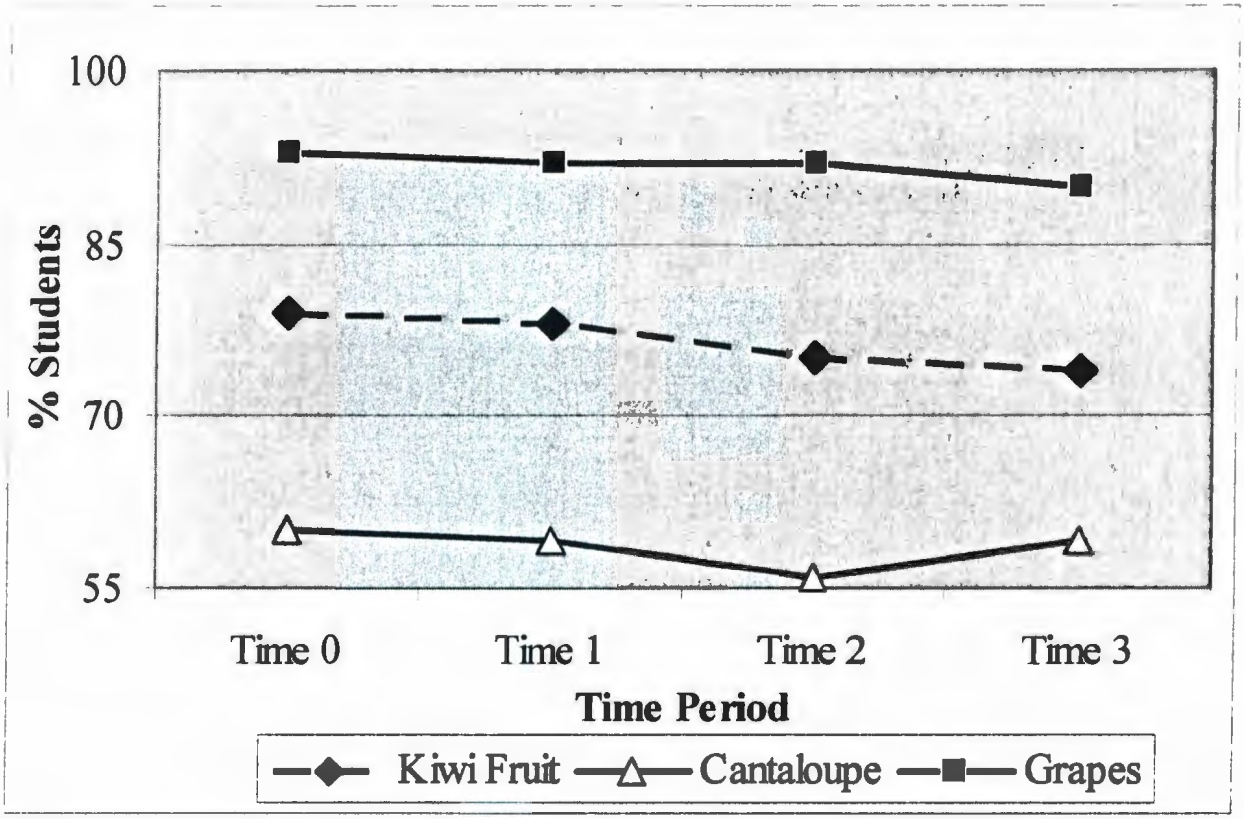

Figure 2. Percent of Students[a] who were Willing to Try[b] the Test Fruits with Time[c]

a N varied with time depending on whether the student completed the question
b Calculated by adding the total number of students who responded 'sort of want to try it', 'in between, so-so, don't care', 'sort of want to try it' and 'really want to try it' (graded 1 to 5 on a 5-point scale)
c Time 0 to time 1 = control period; time 1 to time 2 = intervention period; time 2 to time 2 = follow up period

try it' and 'really want to try it' (graded 4 and 5 on a 5-point scale) to the question 'how much do you want to try this fruit?' Over 60% of students indicated they were 'willing to try' each of the test fruits at the beginning of the study (time 0).

4.7.3 Tasting

Figure 3 presents an indirect but objective measure of the percentage of students actually tasting the test fruits with time. Students were offered four options to the question "How much do you like this fruit?" 1) yucky, 2) just ok, 3) yummy and 4) never tried. Actual tasting was represented by the number of students choosing 'yucky', 'just ok' or 'yummy'. Not tasting was represented by the number who chose 'never tried'. This objective measure of tasting was then compared to students reported willingness to try the test fruits (Figure 4) and reported tasting of the control foods, which were not offered to the students during the study (Figure 5).

4.8 Principal Questionnaire Results

Results from the Principal Questionnaire (appendix F) (N=7) are presented below. Responses to the initial question "what is the total enrollment of elementary students in your school?" are presented in Table 10. These responses were compared to student enrolment data received from the Eastern District School Board and reveal some inconsistencies in information provided.

In response to the question "is there a retail outlet which is within walking distance to your school which can be visited by elementary students to purchase foods during the school day?" two principals responded 'no' and the remaining five responded 'yes, but essentially no

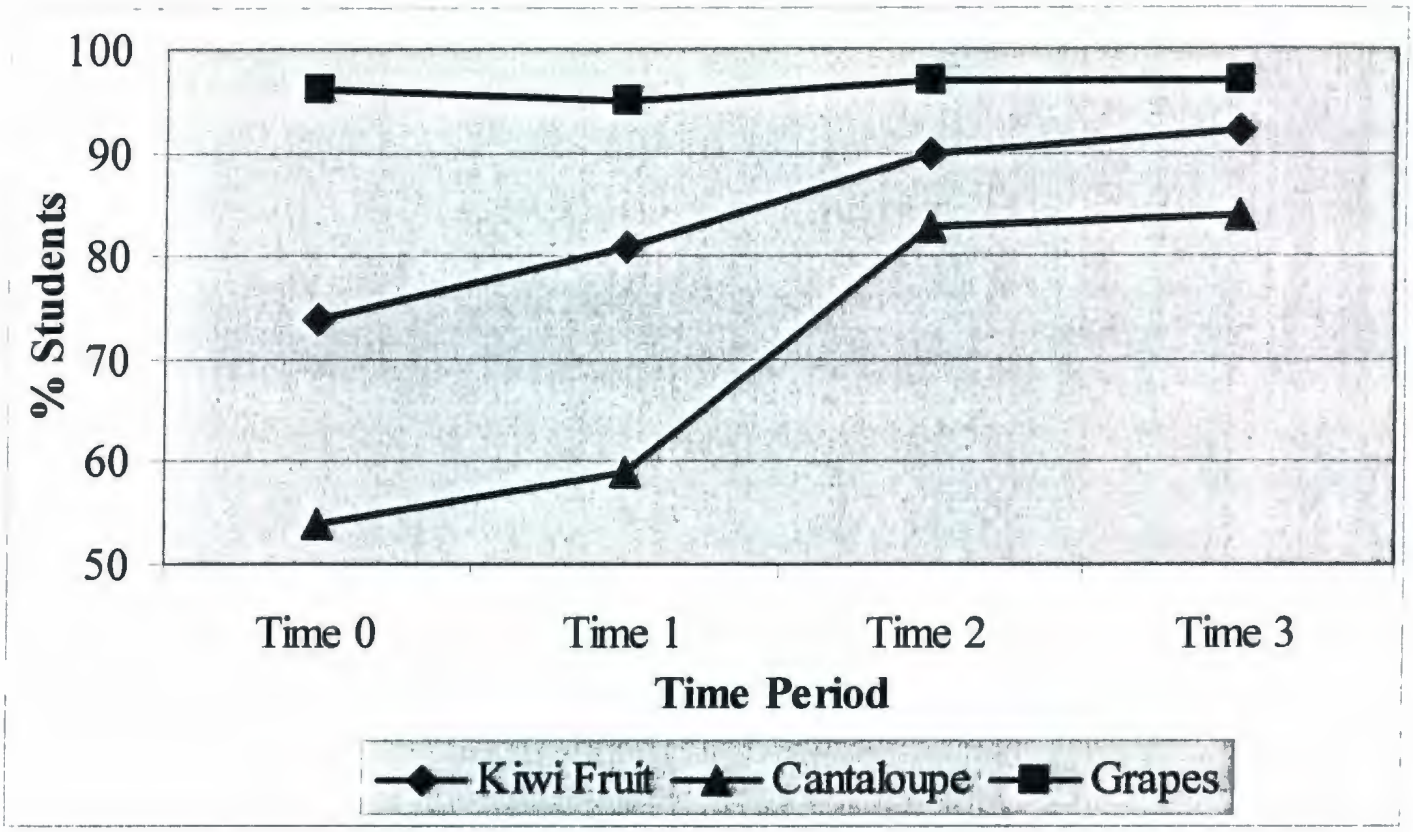

Figure 3. Percentage of Students Actually Tasting[a] the Test Fruits with Time[b]

a Students choosing 'yucky', 'yummy' or 'ok' in response to the question "How much do you like this fruit?" Those who chose 'never tried' were considered to be non-tasters.

b Time 0 to time 1 = control period; time 1 to time 2 = intervention period; time 2 to time 3 = follow up period

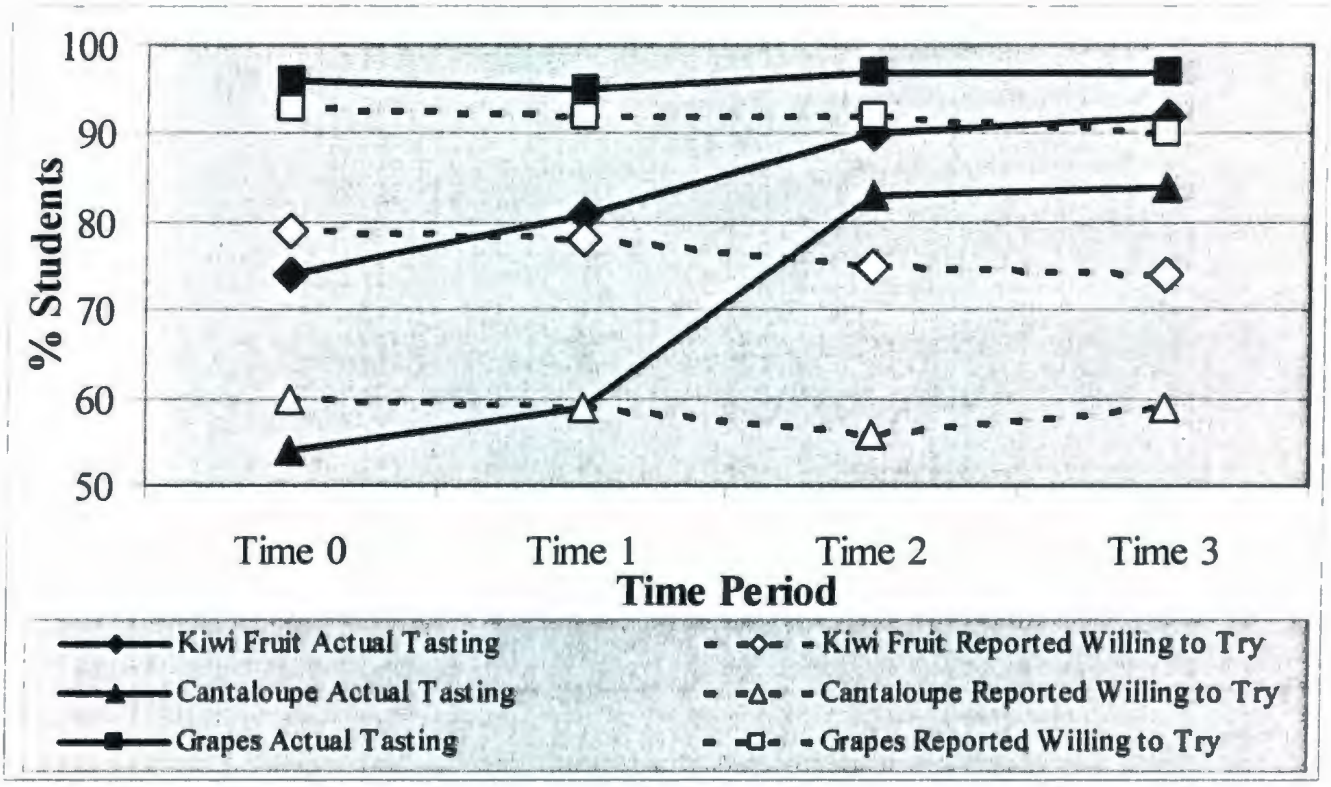

Figure 4. Percentage of Students Actually Tasting[a] the Test Fruits versus the Percentage of Students Reporting Willing to Try[b] the Test Fruits with Time[c]

a Students choosing 'yucky', 'yummy' and 'ok' in response to the question "How much do you like this fruit?" Those who chose 'never tried' were considered to be non-tasters.

b Students choosing 'really want to try' and 'sort of want to try' in response to the question how much do you want to try this food?

c Time 0 to time 1 = control period; time 1 to time 2 = intervention period; time 2 to time 3 = follow up period

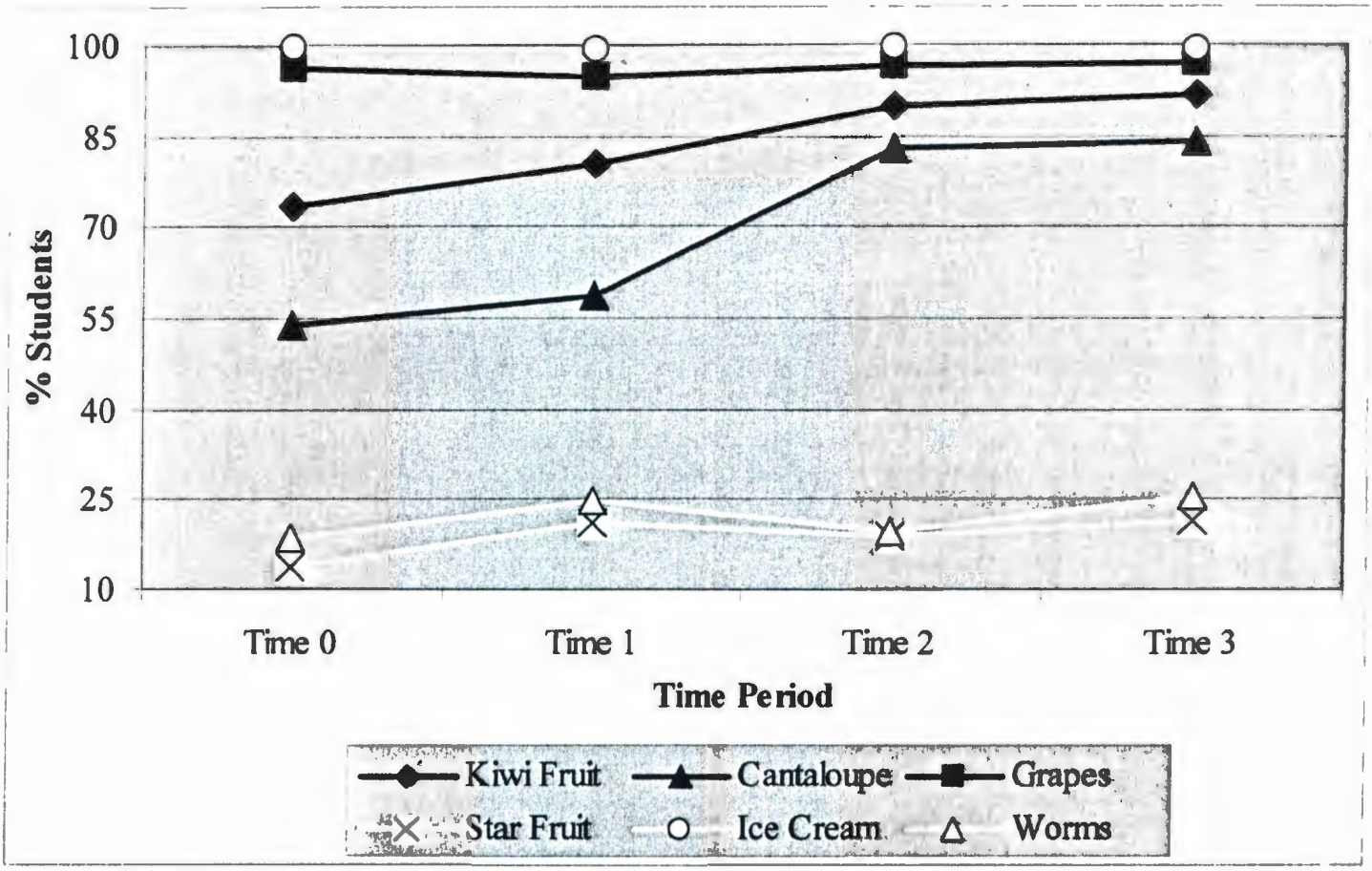

Figure 5. Percentage of Students[a] Actually Tasting[b] the Test Fruits and Reporting Tasting of the Control Foods[c] with Time[d]

a N = 325

b Students choosing 'yucky', 'yummy' and 'ok' on a questionnaire in response to the question "How much do you like this fruit?" Those who chose 'never tried' were considered to be non-tasters.

c Test fruits= Kiwi fruit, Cantaloupe and Grapes; Control foods = Star Fruit, Ice Cream and Worms (never offered to the students during the study period)

d Time 0 to time 1 = control period; time 1 to time 2 = intervention period; time 2 to time 3 = follow up period

Table 10

Principal and School Board Reports of Elementary Student Enrolment per School

School	Grade Level	Total # of Elementary Students Enrolled per School	
		According to School Principals[a]	According to the School Board[b]
1	K-12	142	142
2	K-12	185	70
3	K-4	413	406
4	K-12	48	62
5	K-12	185	181
6	K-12	33	77
7	K-12	163	64
Total (#)		**1169**	**1002**

a Total number of elementary students enrolled per school received from school principals via principal questionnaire

b Total number of elementary students enrolled per school received from the Eastern District School Board

students buy food there on school days. When asked to estimate the average number of elementary students that availed of their school's breakfast program each day before and after the fruit initiative, five of the seven school principals estimated there was no change in student participation. The remaining two principals reported an estimated increase of five and 15 students respectively after the initiative.

Principals were asked to indicate the average monetary intake by their school's canteen and/or cafeteria from the sale of candy items per day. One of the seven school principals indicated their school had monetary intake from the sale of candy items. Table 11 presents principal responses to the final questions of the Principal Questionnaire which asked principals to estimate the consumption of kiwifruit, cantaloupe and green seedless grapes on the first and last days the fruits were offered (difference between servings offered and servings discarded).

Table 11

Principal Estimates of Test Fruit Servings Consumed[a] at the Beginning and End of the Fruit Initiative

		# of Fruit Servings Consumed/Day	
School	**Test Fruit**	**Beginning of Initiative**	**After Initiative**
School 1	Kiwifruit	120	120
	Cantaloupe	120	120
	Grapes	120	120
School 2	Kiwifruit	26	70
	Cantaloupe	18	40
	Grapes	26	70
School 3	Kiwifruit	60	70
	Cantaloupe	60	70
	Grapes	60	70
School 4	Kiwifruit	30	13
	Cantaloupe	20	18
	Grapes	30	13
School 5	Kiwifruit	125	125
	Cantaloupe	192	192
	Grapes	125	125
School 6	Kiwifruit	12	20
	Cantaloupe	2	4
	Grapes	12	20
School 7	Kiwifruit	32	32
	Cantaloupe	24	24
	Grapes	32	32

a Fruit servings consumed = difference between servings offered and servings discarded.

CHAPTER 5

Discussion

5.1 Introduction

The following chapter presents an evaluation of the results of this research and discusses their practical relevance to school based nutrition research. The results of this study are compared with findings of other research papers that discuss similar topics of interest. This assisted with the interpretation of the data and in the development of concrete conclusions and recommendations.

5.2 Program and School Description

During the 2006-2007 school year, the KES Foundation supported 160 nutrition programs in four of the provincial school districts. This provided approximately 44,806 NL students with access to nutritious school snacks and/or meals (Table 1). As of December 2009, the number of KES clubs in the province has risen to 200 (Kids Eat Smart Foundation, 2009b). In comparison to other Atlantic Canadian school nutrition advocate groups, the KES Foundation appears to offer nutrition support to a greater number of students. For instance, the PEI Healthy Eating Alliance supported 49 nutrition programs during the 2006-2007 school year, providing approximately 5,800 students with access to nutritious school snacks and/or meals (Government of Prince Edward Island, 2006). Breakfast for Learning New Brunswick supported 114 nutrition programs during the 2007-2008 school year, providing approximately 10,660 students with access to nutritious meals and snacks (Breakfast for Learning New Brunswick, 2009). Although these and the KES Foundation nutrition programs are providing Canadian students with access to nutritious food at school, the Breakfast for Learning Foundation (2009)

estimates that only 7%-10% of Canada's 5.2 million students receive even partially subsidized school meals. Furthermore, it is estimated that just over 30% of elementary students and 60% of secondary school students do not consume a nutritious breakfast before school (Butler-Jones, 2008). This indicates a potential need for expansion of nutrition programs, including breakfast programs in Canadian schools.

Table 2 further illustrates that of the seven participating schools, five were located in rural communities and two were located in urban communities. The presence of KES Foundation nutrition programs in rural schools is particularly important as NL in recent years has had the highest percent of individuals in rural areas falling below the low income cutoff (Government of NL, 2005c). These programs enable children, including those living in low income households, to avail of nutritious foods that they may not otherwise be able to access.

Maurer (1984) found that students from low income families are more likely to participate in school nutrition programs than those from higher income families. Maurer also found that students who live in rural areas were more likely to participate in their schools breakfast program than similar students in urban areas. This supports findings in the present study whereby both urban schools had below average student participation (41%) in their schools breakfast program. In comparison, four of the five rural schools had above average student participation in their schools breakfast program (Table 2).

5.3 Response Rate

Obtaining consent from parents/guardians for completing research activities is common with school based nutrition research (Ross, Sundberg & Flint, 1999). Children are considered a vulnerable population by most research ethics boards and as such, issues of consent and confidentiality of responses are of primary importance. The initially proposed consent process for the present study was a passive consent process which requires parents to respond only if they do not want their child to participate in the research study (Esbenson et al., 1996). This process was successfully used in a prior study conducted by Taylor et al. (2003) which involved sending letters home to parents/guardians of potential student participants to inform them of the research project. Parents/guardians who did not want their child/children to participate were advised to notify the school of their decision.

Since the test fruits in the present study were offered as part of the school's pre-existing KES Foundation breakfast program, consent was not required for the child/children to taste the fruits but only to complete the questionnaires. Participation in KES Foundation nutrition programs does not require written parental consent. It has been argued that if such consent was required then many of the children most in need of utilizing this program would not be permitted to do so. There is evidence to suggest that the parents/guardians of less advantaged students are less likely to sign permission slips and return them to school (Blom-Hoffman et al., 2009). Furthermore, literacy level of the parents/guardians may have impacted their understanding and completion of the consent form. Adult literacy is measured on a scale from one to five, level one being the lowest

level and four and five being the most advanced levels. To function well in society a person must have at least level three literacy. The most recent literacy data from 2003 indicates that more than half (55%) of the NL population aged 16-65 years had literacy scores below level three (Human Resources and Skills Development Canada, 2010). According to the Canadian Council on Learning (2010), of the Eastern Health Authority population, between 50-80% of the population have health literacy at level 2 and below.

A passive consent process whereby letters would be sent home with parents informing them of the research project was initially proposed by the researchers and approved by the MUN Human Investigations Committee (HIC). The researchers received verbal confirmation from the Eastern School District that the proposed passive consent process was also acceptable to them. However, prior to the start date of this project, the researchers were informed by the Eastern School Board that as per their policy, active consent procedures were in place. Active consent procedures require parents to sign a consent form indicating permission for their child to participate (Ellickson & Hawes, 1989). As such, the proposed passive consent process had to be changed to comply with this policy and subsequently reapproved by the MUN HIC. Some researchers believe active consent procedures can result in lower participation rates (Esbensen et al., 1996), are more costly to undertake (Ellickson & Hawes, 1989) and may result in biased samples if the consent rate is low and/or not representative of the participating schools, which can implicate the study's validity (Anderman et al., 1995).

Only 57% of all potential participants returned a signed consent form to the school allowing the child/children in question to participate (571 of 1002). However, it is important to note that this percentage appears to be skewed by a lower return rate in three of the seven schools (e.g. schools 2, 3 and 4). The remaining four schools (e.g. schools 1, 5, 6 and 7) had a response rate of over 80% (Table 3). Of the 571 students who were eligible to participate, only 57% (325 of 571) went on to complete the questionnaires distributed during all four data collection periods (Table 3). In some schools over 70% of the participating students completed all four questionnaires, while in other schools as low as 2% of the participating students completed all four questionnaires.

In comparison, 100% (N=379) of the students approached to participate in the PEI study conducted by Taylor et al. (2003) did so. Written parental consent was not required in this study. Instead, parents were informed of the project and instructed via a take home letter to call the school if they did not want their child to participate. If the same consent process had been used in the present study, the number of respondents would likely have increased considerably (Esbensen et al., 1996) and consequently analysis of the data provided by the larger number of respondents might have provided statistically significant findings (Jackson, 1999).

It has been established that changes in behaviour associated with food intake in our society are rarely extreme in nature and are incorporated into practice only gradually (Thomas et al., 2004). Normally, to ensure that a change in eating behaviour of a statistically significant magnitude is achieved in a study according to acceptable methods

of data analyses, the number of participants providing data must be high. Generally, participation rates of 75% and higher are considered desirable, while rates around 50% and lower are considered less than desirable (Ellickson & Hawes, 1989; Jessor et al., 1995; Severson & Ary, 1983). Considering that little over half (57%) of the school children's parents/guardians returned signed consent forms to the school, the participation rate in this study could be considered less than desirable as not all students allowed to participate would chose to do so. The requirement of returned signed parental/guardian consent forms by the Eastern School Board was understandable, however it negatively impacted on the ability to find statistically significant results.

5.4 Student Description

Shortcomings of previous research of this nature include small sample sizes. This study sought to address this shortcoming by distributing consent forms to over 1000 parents/guardians of elementary school children that could potentially participate in this study. Five hundred and seventy one students were eligible to participate, which is a larger sample than in other studies aiming to increase children's acceptance of an unfamiliar food. For instance, early research by Birch and colleagues (Birch & Marlin, 1982; Birch et al., 1987; Sullivan & Birch, 1990) was conducted with 43 children or less. More recent research by Wardle et al. (2003b; 2003a) and Taylor et al. (2003) was conducted with larger samples of 72, 156 and 379 students, respectively. All authors indicated that these sample sizes may have limited generalizability to a larger population.

The researchers randomly selected schools in the Eastern School District who had indicated an interest in participating in this study. However, since the researchers were limited to analyzing data from children whose parent/guardian gave written consent, the sample was not truly selected at random. The representativeness of other demographic information cannot be commented on as there are a number of sociodemographic factors which were not investigated. Low parental education, as well as parental income are associated with less healthful diets in children and adolescents and as such may be of interest to investigate in future studies of this nature (Van der Horst, et al., 2007).

5.5 Student Questionnaire

The student questionnaire assessed the students 'liking' of three control foods and 'liking' and 'willingness to try' three test fruits over a 28 week period.

5.5.1 Control Foods

Students in the present study were asked to indicate how much they liked star fruit, ice cream and earth worms which acted as controls and were not offered to participating students at any time during the present study. Since students were not exposed to these control foods, there would be no reason for the children's liking of them to change. As expected, the Wilcoxon signed rank test indicated there was no significant change in 'liking' scores for the control foods during the control, intervention or follow up periods. This is consistent with findings from the study conducted by Taylor et al. (2003) where no significant change in 'liking' scores for the control food (e.g. Chinese pear) was found after the exposure period.

Of the 325 students who completed the questionnaires at all four time periods not all of the students responded to the question asking them to indicate their liking of each of the control foods. For instance, Table 5 illustrates that only 11 (3%) students responded to the question asking them to indicate their liking for star fruit and 20 (6%) students responded to the question asking to indicate their liking for earth worms. In contrast, 312 (96%) students responded to the question asking to indicate their liking for ice cream. Sullivan & Birch (1990) suggest that children tend to prefer foods that are familiar, compared with foods that are not, regardless of the foods' sensory characteristics. Considering this, students were likely familiar with ice cream and as such may have been more compelled to complete the questions about this food, more so than questions pertaining to star fruit and earth worms. Another possibility for the low response to the liking questions pertaining to starfruit and earth worms could be that the students didn't understand the question asked of them. A greater number of students didn't answer these questions possibly because they had never tasted starfruit or earth worms and may have thought they could only answer the questions about ice cream as this is the only thing that they had eaten. Although it was expected there would be no significant change in liking scores for the control foods with time, an increased number of respondents would have strengthened the results of the Wilcoxon signed rank test.

Although star fruit was considered to be unfamiliar to the participants due to its limited availability, many students rated the fruit as 'just ok' or 'yummy' throughout the duration of the study (Table 5). A recent Cornell University study involving almost 200 four-year olds, found that the children ate nearly twice as many "X-ray Vision Carrots" compared

to days when the carrots were labeled "carrots" (Noble, 2009). Considering this, the fun name of this exotic food may have contributed to its positive preference rating by the students.

5.5.2 Test Fruits

For each of the three test fruits, the students were asked to indicate if they 'liked' the fruit and how much they were 'willing to try' it. An indirect but objective measure of actual tasting of the fruits was also attempted. The following sections discuss the results of the student's responses to these questions.

5.5.2.1 Liking.

Results of the Friedman matched samples test indicate there were no significant changes in liking scores for either of the test fruits across the control, intervention and follow up periods. To allow for a comparison to findings of the Taylor et al. (2003) study where a paired t-test was used for analysis, data in the present study were re-analyzed using paired t-tests (see Table 12 in appendix R). A paired t-test conducted on these data revealed a significant increase in liking scores for cantaloupe during the intervention period ($p < 0.047$). This result is consistent with Taylor's results which also reported a significant increase in liking scores for cantaloupe during the intervention period.

Although the paired t-test was able to detect a significant difference in liking scores for cantaloupe in the present study, it is important to note that the non-parametric Friedman and Wilcoxon tests are more appropriate to use for ordinal (categorical) data and when participants serve as their own controls (Munro, 2005). The Friedman test may have failed to detect any significant differences in liking for the test fruits in this study as this

type of non-parametric test tends to be less sensitive than the parametric tests (Pallant, 2007).

The percentage of students who liked (rated 'yummy') the test fruits with time is presented in Figure 1. Less than 60% of students indicated that they liked cantaloupe at the beginning of the study (time 0). However, over 75% of students indicated that they liked green seedless grapes and kiwifruit at the beginning of the study (time 0). Considering that a majority of students entered the study already liking kiwifruit and grapes, there was not much room for a positive change to occur. As such, it may have been beneficial to assess the degree to which students liked the taste of these fruits prior to their selection as test fruits for this study. For instance, exploratory taste tests such as those conducted in studies by Wardle et al. (2003a; 2003b) could have been conducted prior to the present study to ensure the fruit to be offered was comparatively novel and relatively disliked. However, it is important to note that the test fruits offered in this study were chosen as they are considered to be 'breakfast' foods among the Atlantic Canadian population. As such, fruits were a more appropriate choice to offer to children during a school breakfast program than other foods, such as vegetables. The test fruits offered were also available from local rural and urban food suppliers during the intervention period. Cost from local food suppliers was also a consideration. Finally the fruits were perceived as relatively unfamiliar to students from the participating rural Atlantic Canadian schools according to the literature (Taylor et al., 2003).

5.5.2.2 Willingness to try.

The percentage of students who were willing to try (rated 4 or 5 on a 5 point scale) the test fruits with time is presented in Figure 2. Approximately 90%, 80% and 60% of students indicated they were willing to try green seedless grapes, kiwifruit and cantaloupe respectively at the beginning (time 0) of the study. As discussed above, considering over 60% of the students were initially willing to try the test fruits, a pretest to determine the degree of students' familiarity of these fruits may have been warranted prior to their selection. Other test fruits might have elicited different responses.

5.5.2.3 Tasting.

Instead of having to rely solely on the children's self reporting of their 'willingness to try' a fruit, the researchers made an assumption that if a child chose 'yucky', 'just ok' or 'yummy' and not 'never tried' in response to the question "How much do you like this fruit?", that they had actually tried/tasted the fruit. Similarly, the researchers assumed that if the child chose 'never tried' in response to the same question that they had not tasted the food.

The researchers attempted to use this objective measure of tasting to estimate the percentage of students who had actually tried the test fruits with time. Albeit of an insignificant magnitude, a trend became apparent (Figure 3), whereby the more unfamiliar the fruit the greater the increase in the number of students apparently tasting it with time and during the exposure period (time 1 to time 2). Cantaloupe was the most unfamiliar, having been tried by approximately 55% at time 0; kiwifruit intermediate

with just under 75% having tried it at time 0; and green grapes being familiar to many as they had been tried by over 90% of participants at time 0. Towards the end of the study, over 80% of students had tasted all the test fruits. Cantaloupe was also found to be the most unfamiliar fruit in the Taylor et al. (2003) study and saw the most significant increase in the percentage of students tasting it with time. As expected, there was no significant increase in the tasting of the test fruits during the eight week control period (time 0 to time 1), which occurred prior to the intervention, or the 10 week follow-up period (time 2 to time 3) which occurred after the intervention, as the fruits were not offered at school during either of these times.

Students' actual tasting of the test fruits was compared to their reported 'willingness to try' the test fruits with time (Figure 4). It was expected that the percentage of students actually tasting the test fruits would reflect the percentage of those willing to try the test fruits. As illustrated in Figure 4, the students' actual increases in tasting were not consistent with their reported willingness to try the test fruits with time. One possible interpretation is that the students' reported willingness to try the test fruits is not reflective of their actual behaviour of tasting the fruits offered. This would indeed put in question the validity of the questionnaires used.

A chi-square test for independence was conducted to further explore the relationship between students self-reported 'willingness to try' and their 'actual tasting' of the test fruits. This test indicated a significant association between student's self reported willingness to try and actual tasting of cantaloupe, kiwifruit and green seedless grapes throughout the study period (time 0 to time 3). This indicates that the proportion of

students who were 'willing to try' the test fruits is significantly different from the proportion of students who had 'actually tasted' the test fruits. For instance, Table 13 (appendix S) illustrates that at the beginning of the intervention period (time 1), 58.5% of students indicated they were 'not willing to try' and also had 'never tasted' cantaloupe. However, at the end of the intervention period (time 2) 70.3% of students indicated that they were 'not willing to try' cantaloupe but had 'actually tasted' it. It would be expected that if students were not willing to try cantaloupe, their behaviour would support this and they would not actually taste it. However, the results of the chi-square test suggest differently.

Students' actual tasting of the test fruits was next compared to their reported tasting of the control foods, which were not offered during the study period (Figure 5). As with the test fruits, the researchers assumed that if a child chose 'yucky', 'just ok' or 'yummy' in response to the question "How much do you like this food?" that they had actually tried/tasted the control food. Although these control foods were not offered, it was expected that the students would have never tasted earth worms and as such would choose the response 'never tried'. Similarly, it was expected that many students would have tasted ice cream, either at home or at school and as such rated it as 'yummy'. As expected, few students (10-25%) had tasted star fruit and many (99%) had tasted ice cream (Figure 5). Surprisingly, some students (10-25%) reported they had tasted earth worms. These students may have potentially misunderstood the question asked of them and/or may have responded 'yucky' instead of 'never tried' to this question.

5.6 Student Questionnaire Validity

One important finding of this study is that it has raised questions pertaining to the validity of the student questionnaires used by us and others. It is possible that the student questionnaire did not provide anticipated findings because the children didn't really understand what was being asked. In some studies on child related food behaviour, mothers instead of the children have filled out the questionnaires (Pliner, 1983; Skinner, Carruth, Wendy & Ziegler, 2002).

The validity of a questionnaire scale refers to the degree to which it measures what it is supposed to measure (Pallant, 2007). In the present study, the student questionnaire may not have accurately measured what it was supposed to measure. For example, when students in the present study reported that they were 'willing to try' a fruit, it was questionable whether the questionnaire actually measured their willingness to try the food. Willingness to try a food is a precursor to actually tasting a food (Rubio, Rigal, Boireau-Ducept, Mallet & Meyer, 2008). Repeated tasting is a precursor for liking a food and consuming it as part of the diet (reviewed by Birch, 1999). As willingness to try a food increases it is expected that the actual tasting of the food would also increase. Furthermore, in a validation study involving children (aged 7-12 years), the correlation of the scale used in the present study with a behavioural measure of willingness to eat novel foods was 0.33 ($p>0.0001$) (Lowen & Pliner, 1999). This suggests that the children's responses to the survey used in the present study should reflect their actual willingness to and actual tasting of the test fruits. However, as the chi-square test indicated the proportion of students who were 'willing to try' the test fruits is significantly different

from the proportion of students who had 'actually tasted' the test fruits. This suggests that what the children reported in this study was not reflective of their behaviour. This may have resulted from the students not understanding and responding to the question incorrectly or their desire to be compliant and as such indicating that they were willing to try the food in question without actually tasting the food.

The type of scale used in the student questionnaire may have further negatively impacted the questionnaire's validity. For example, the Likert scale used in the present study to assess liking of the test fruits consisted of a three-point faces scale designed to represent responses of 'yucky'(1), 'just ok' (2) and 'yummy' (3), as adopted from Taylor et al. (2003). A study conducted by Wardle et al. (2003b) assessed liking among five to eight year old children using a five-point faces scale designed to represent responses from 'I dislike it a lot' to 'I like it a lot'. A commonality of three and five point scales is that they both allow a 'neutral' choice (e.g. 'just ok' graded as 2). A recent study aiming to develop and validate a self-reported questionnaire on food neophobia in five to eight year old children incorporated four point scales. In this case, the researchers chose to use a pair or choice forced scale (without a mid level) so the children could not adopt a neutral attitude, as such a scale seems appropriate when questioning children (Rubio et al., 2008). Questionnaires designed for children which incorporate four answer choices to questions may yield more valid data. The points raised regarding the validity of the student questionnaire suggest a need to determine the effectiveness of this survey instrument at evaluating the self-reported food preferences of five to 12 year old children.

5.7 Study Design

A number of factors regarding the design of the present study may have contributed to the outcomes of this study. These factors include details surrounding the inclusion of controls, the level of exposure to novel fruits or foods and the actual school intervention.

5.7.1 Controls

The design of the present study attempted to build on and improve upon previous studies (Taylor et al., 2003 Wardle et al., 2003a, 2003b) by incorporating control and follow up periods and control foods. Although no significant results were found, the inclusion of a control period and control foods allowed for comparison and should have strengthened some of the findings. The inclusion of a follow up period in research of this nature also has the potential to identify sustained improvements in children's acceptance of new foods over time (Wardle et al., 2003b).

The present study incorporated a within-subjects design whereby participants served as their own controls. Essentially, the same participant was exposed to different levels of a particular treatment. As such, most of the possible extraneous influences such as gender, age, socioeconomic status, background characteristics, intelligence and values were controlled (Jackson, 1999). In comparison, designs which assign people to different treatment groups (Wardle et al., 2003a, 2003b) depend on the randomized assignment to adjust for known and unknown variations between the groups (Jackson, 1999). Considering this evidence, one could argue that the within-subjects design provides

control over a number of extraneous variables and as such, may be preferred over other research designs in before and after studies.

5.7.2 Level of Exposure

An exposure based methodology was used in the present study in an attempt to increase school children's liking, willingness to try and actual tasting of novel fruits. Although this methodology has been used successfully in previous interventions (Taylor et al., 2003; Wardle et al., 2003a, 2003b), one thing that has often differed is the level of exposure required to induce a change in children's level of preference (e.g. liking and willingness to try). For instance, Taylor et al. (2003) found an overall increase in liking and willingness to try the fruits and vegetables offered to children after only six weekly exposures (one weekly snack for 6 consecutive weeks). In comparison, Wardle et al. (2003b) and Wardle et al. (2003a) found significant changes in children's acceptance and/or preference for novel foods after a series of snacks offered during 8 and 14 consecutive days, respectively.

All students were encouraged by the program coordinators to taste the test fruits offered. Adult encouragement has been suggested as an effective means to entice children to try new foods (Harper & Sanders, 1987). Adult and peer modeling have also been suggested as an effective route to promote children's consumption of a previously disliked or unfamiliar food (Birch, 1980; Duncker, 1938). However, since the program coordinators were to report the amount of each test fruit offered before and after the intervention, they were advised not to taste or eat the test fruits themselves. Encouragement by the program

coordinators and modeling by the other children tasting the test fruits may have directly influenced the students' preferences or it may have indirectly increased the likelihood of the students to taste the test fruits, therefore promoting liking through taste exposure.

In addition to the level of exposure, the age at which a child is exposed to a novel food may be a factor in how well they accept it. Results from a study with infants (ages 4 to 6 months) indicated that repeated exposure to a new food dramatically increased infants' intake of the food (Sullivan & Birch, 1994). In comparison, slower increases in intake have been reported with repeated exposure to novel foods in preschool children (Birch, Gunder, Grimm-Thomas & Laing, 1998). Birch and Marlin (1982) reported that among 2-year old children, ten exposures were necessary before preferences for novel foods increased. However, Sullivan and Birch (1990) reported that up to 15 exposures were required before preferences increased in children aged 4 and 5 years. In older children (aged 10-12 years), repeated exposure has been shown to increase their willingness to taste novel foods, which is a prerequisite for developing a preference for a particular food (Loewen & Pliner, 1999). These findings suggest that as children become older they may require a higher level of exposure to a new food before they accept it.

The present study offered children a total of eight exposures to each novel fruit over an eight week period (e.g. each of the test fruits were offered once per week for eight consecutive weeks) and found no significant changes in the children's liking or willingness to try these fruits. Students in the present study ranged in age from five to 12 years. All students experienced the same level of exposure to the test fruits. Considering

this, the level of exposure (e.g. consecutive daily vs. weekly offerings) required to increase preference for novel fruits among children aged five to 12 remains unclear to the researchers and requires further investigation.

5.7.3 Intervention

The researchers made attempts to repeat the methodology used in the Taylor et al. (2003) study as much as possible. However, Taylor's study had more positive findings than the present study. The same questionnaires were used but in Taylor's study they were administered twice (pre and post intervention) by trained dietetic interns and an experienced research coordinator, while the fruits and vegetables were prepared and offered to the 379 student participants by parent and student volunteers (Taylor et al., 2003). Comparatively, in the present study breakfast program coordinators who were parent or school volunteers, were responsible for administering the survey at four different times (twice pre and twice post intervention) and preparing and offering the test fruits to approximately 700 student participants (Table 2). Although the researchers were able to increase the number of participating students, the workload expected of the coordinators in the present study would have been higher than in the Taylor study. This may have resulted in less supervision of the students when completing the questionnaires. The majority of studies with children of this age have been directly supervised by the researcher or research coordinator when the children are completing self-administered questionnaires (Guthrie et al., 2000; Loewen & Pliner, 1999; Rubio et al., 2008; Taylor et al., 2003; Wardle et al., 2003b). We attempted to keep the number of participants high and this did not allow for as much supervision. Although previous studies have had close

supervision by a researcher or coordinator, this may influence the children to respond the way the supervisor would want them to. Less supervision, as used in the present study would limit this bias but rely more on the validity of the questionnaires and the students' understanding of the meaning of the questions and how to answer them.

Furthermore, while three schools from PEI participated in the Taylor study, seven schools in NL's Avalon Peninsula participated in the present study. Considering the large geographic span of the NL schools and the requirement to administer the questionnaires and offer the test fruits at the same time each day at each school, it was impossible for the researchers to be present at all schools and monitor the research progress. As such, school principals and program coordinators were in part responsible for ensuring the successful implementation of the research protocol within each school. The researchers held many teleconferences with the program coordinators and school principals to ensure their understanding of the research protocol; provided a script for the coordinators to read prior to administering the questionnaires; and provided sample questionnaires which included coloured pictures of the test fruits and control foods to be reviewed in the classroom with the students prior to and as they were completing the questionnaires. Despite these complete instructions, several factors including the large number of students, the increased participation expected of the school principals and program coordinators, and the limited ability of the researchers to be present at each school to help implement the research may have contributed to the insignificant findings of this study.

5.8 Principal Questionnaire

A self-administered questionnaire was used to collect data from principals of participating schools (Appendix F). Principals of participating schools were asked to indicate the total enrollment of elementary students in their school. The responses provided were compared with data received from the Eastern School District indicating the total number of elementary students enrolled in the participating schools. As illustrated in Table 10, only data received from the principal of school 1 was consistent with data received from the school board. For example, the school principal of school 7 reported that 163 elementary students were enrolled in that school. In comparison, the school board reported that 64 elementary students were enrolled in school 7. It is possible that the school principal may have reported the total number of students enrolled (e.g. from K-12) versus the total number of elementary students enrolled. These discrepancies highlight concern regarding the accuracy of the school principal's responses.

Principals were also asked to estimate the consumption of kiwifruit, cantaloupe and green seedless grapes on the first and last days the fruits were offered (e.g. the difference between servings offered and servings discarded). These results are illustrated in Table 11 and add further weight to the possibility that the principal responses to the questionnaire may be inaccurate. For example, the principal (and program coordinator) from school 5 indicated that 192 servings of cantaloupe were offered to the students availing of the school's breakfast program (Table 11). Only one serving of each test fruit was to be offered to the students. This information contradicts the information provided

in Table 2, where the same school principal reported that a total of 135 students participated in the breakfast program at this school.

Considering the possible inaccuracies of the principal responses, the researchers chose not to rely heavily on responses to the principal questionnaires. It is recognized that the role of a school principal is quite a busy one and their time spent on this project was purely voluntary. However, their responses did suggest that the purchase of food items from a retail outlet was likely not a factor impacting on student's food consumption during this study. Furthermore, only one principal indicated that candy items were available for purchase by students on their school's premises. This ultimately may have a positive influence on the student's consumption of healthy foods (Cullen, Eagan, Baronowski, Owens, & de Moor, 2000; Cullen & Zakeri, 2004). Principals and program coordinators would often informally notify the researchers of how beneficial they felt the program was and of the many positive comments from staff and students. The inclusion of qualitative data from these sources may be a consideration for future research.

Children's fruit and vegetable intake is influenced by many factors, including the school environment (Taylor et al., 2005). Research indicates that increased variety, availability and accessibility to high fat and calorie foods through school snack bars has a negative impact on students' consumption of healthy foods, including fruits and vegetables (Canadian Diabetes Association, 2002; Cullen et al., 2000; Cullen & Zakeri, 2004). Schools across Canada are making progress at improving their food and nutrition environments. During the time this study was conducted, the NL School Food Guidelines

were introduced to schools across the province, including those within the Eastern School District. The School Food Guidelines outline a recommended selection of food and beverages to be offered in school cafeterias, canteens and vending machines. The Guidelines were created to support the provision of healthy food choices and quality information to promote student health and wellness (Government of Newfoundland and Labrador, 2006e). The guidelines suggest that candy items not be sold on school premises. Six of the seven schools in this study did not appear to sell candy items. This may suggest the progressive adoption of healthy food choices within the participating schools in this study in response to the School Food Guidelines.

5.9 Summary of Study Benefits & Limitations

As with most research, benefits and limitations are inherent in this study. The benefits are highlighted below.

1) Adopting the student questionnaire from the Taylor et al. (2003) study conducted in PEI and addressing the shortcomings of previous exposure based studies enabled the research team to carry out the present study and further research of this nature in Atlantic Canada.

2) Conducting this research project in a real life elementary school setting through pre-existing school breakfast programs may have enhanced the naturalistic experience for the children participating in this research.

3) Through its partnership with the KES Foundations *Fruits and Veggies First!* initiative, this research project may have enhanced school children's access and exposure to the new fruits offered.

4) In comparison to previous studies aiming to increase children's food acceptance and preference there was an increased number of respondents in the present study.

5) The within-subjects design used in this study controlled for a number of extraneous variables such as values, intelligence, background characteristics and other variables that may vary among children if assigned to different treatment groups (e.g. randomized assignment).

6) The low level of program coordinator and researcher supervision over the students during the questionnaire implementation process limited any potential bias from the coordinators/researchers influence over the student's responses. Instead, this study needed to rely more on the validity of the student questionnaire and the students' responses to its questions.

7) The inclusion of a control period and control foods allowed for comparison and should have strengthened some of the findings.

8) The inclusion of a follow up period allowed for further insight into the sustainability of the research efforts.

9) By fostering a partnership between research and school communities, this project supported a healthier school environment for the students, fostered a greater understanding and appreciation for the practical impacts associated with school nutrition research among the researchers, and potentially enhanced the importance of participating in such research among the broader school community.

In addition to the benefits of this study, limitations were also found. The limitations of this study are highlighted below.

1) Although a larger sample size was sought to strengthen findings, the school board requirement to obtain written parental/guardian consent for student participation contributed to a lower than anticipated response rate. Such a policy was not a factor in similar studies conducted in PEI nor were they explained in early contacts with the Eastern District School Board during the planning process for this project. This resulted in only 57% of parents/guardians providing consent.

2) Seasonal and funding issues as well as the type of program (e.g. breakfast program) resulted in the selection of fruits (versus vegetables) which are considered an acceptable food to be served at breakfast. Findings may have been significantly positive if different test foods or fruits were chosen or if exploratory taste tests were conducted first to ensure the test food was novel.

3) Since the test fruits were being offered as part of each school's pre-existing breakfast program, other breakfast foods such as toast and juice may have also been offered during the time the test fruits were offered. The availability of other breakfast foods during this study's intervention period may have influenced the students' decision to taste the test fruits. In comparison, other studies aiming to increase school children's acceptance of fruits and/or vegetables offered the test foods alone and consequently did not have competition from other foods. Only the test fruit and/or vegetable was available for children to try.

4) This study was conducted in seven schools over a 26 consecutive week period (e.g. eight week control period, eight week intervention period, and 10 week follow up period). Due to the length of the school year (e.g. September to June or 38 weeks) and various school holidays, it would be very difficult to conduct a longer study or incorporate a longer term control, intervention and/or follow-up periods. An extended intervention period might have supported more significant findings.

5) The large geographic distribution of the participating schools and the requirement of each school to implement the intervention at the same time and on the same days limited the ability of the researcher to be physically present at each school during the research intervention process (e.g. questionnaire and/or test fruit administration). Closer control over the research intervention may have helped the process.

6) The student questionnaire used in the present study had been pre-tested and used successfully by other researchers in similar investigations. However, results of the present study suggest that what the children reported on this questionnaire was not reflective of their actual behaviour. The use of an alternate student questionnaire or tool to assess students liking and willingness to try novel fruits may be warranted.

CHAPTER 6

Conclusions and Recommendations

6.1 Conclusions

In partnership with the KES Foundation of NL, this study sought to assess the impact of an exposure-based intervention on elementary students' liking, willingness to try and tasting of three new fruits introduced through their schools' breakfast programs. Although no significant increases were found, trends suggest that the intervention may improve school children's actual tasting of the fruits offered. Results suggest that the more unfamiliar the fruit, the greater the increase in the number of students trying it with time.

The significance of this study lies in its ability to provide guidance with the design and methodology of future studies and school nutrition programming aiming to improve children's consumption of novel foods. The knowledge gained from the methodology used in the present study is extensive and reflects various points of interest related to the school environment; the student questionnaire; consent procedures; the level of exposure; the students' degree of familiarity with the test food(s); and partnerships with the school community, associated nutrition support foundations and food suppliers.

In addition to the quantitative findings of this study, the qualitative reports of the school children, principals and program coordinators highlight the importance and potential benefits of the KES Foundation breakfast programs, the *Fruits and Veggies First!* initiative and the associated research project. As stated by one of the school principals

"the benefits of such a program are monumental and the success can surely be measured by the willingness of the children to try new fruits and then ask for more!"

6.2 Recommendations

Based on the findings of this study, recommendations are proposed that may enhance future research and school programming of this nature. Recommendations that may assist in the further development of such research and methodology include:

1) Enhancing support of the school community to increase the response rate of school based nutrition research. One way this can be addressed is through school board policies that allow 'passive' consent procedures for research which poses minimal to no risk to the student participants.

2) Revising the principal questionnaires or choosing alternative routes to investigate possible factors which might influence school children's food intake during the school day, such as through the school board and/or nutrition support foundations (e.g. KES Foundation).

3) Validating the student questionnaire for use among children aged five to 12 years. The use of a forced choice scale, so that children cannot adopt a neutral attitude should also be considered as such a scale may yield more valid data.

4) Measuring indicators of socioeconomic status. As socioeconomic status can negatively influence dietary behaviours of children, its assessment in future food exposure intervention studies may yield important information on the influence that school nutrition programs have on the dietary intake of low income students.

5) Seeking opportunities for research to 'piggy back' on existing school nutrition programs. These programs often provide access to the necessary resources (e.g. school children, healthy food, volunteers, food suppliers, etc.) required to conduct school based nutrition research. Benefits of school-research partnerships include the generation of practical evidence based information and enhancing the naturalistic experience for the student participants, among others.

6) Determining the length of the school year and the length of research interventions when creating research timelines.

Recommendations that may assist in the future development of exposure based interventions aiming to increase fruit or nutritious food consumption by children include:

7) Assessing the level of exposure required to induce a positive change in liking and willingness to try novel foods specifically in children aged five to 12 years. Older children may require a higher level of exposure to a new food before they accept it.

8) Assessing the students' degree of familiarity with the test foods prior to their selection and administration to ensure the foods are comparatively novel and relatively disliked.

9) Assessing the availability of and the students' exposure to other foods offered at school and/or at home that may potentially influence the intervention and its outcome.

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APPENDIX A:

Kids Eat Smart Foundation Project Support Letter

Kids Eat Smart Foundation
NEWFOUNDLAND & LABRADOR

October 14, 2006

To: Human Investigation Committee
Memorial University of Newfoundland

From: Annette Edwards, Dietitian & Program Development Coordinator
Daphne LeDrew, Executive Director

The Kids Eat Smart Foundation Newfoundland and Labrador is pleased to partner with the Faculty of Medicine – Division of Community Health for a research project stemming from the *Fruits and Veggies First!* Initiative, recently launched by the Foundation.

Annette Edwards
Annette Edwards

Daphne LeDrew
Daphne LeDrew

P.O. Box 26009, 95 Bonaventure Place
St. John's, NL A1C 5T9
Tel. (709) 722-1998
Toll Free 1-877-722-1008
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National Partner

Sustaining Partners

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

PETRO-CANADA

APPENDIX B:
Project Timeline

Final TimeLine for 'New Fruit' Initiative

December 7, 2006	Last date for signed principal and program coordinator consent forms to be submitted to KESF. Last date for signed parent consent forms to be submitted to school.
December 11-15 (Any weekday)	Administer initial set of questionnaires to K-6 students.
February 2, 5 or 6 (Fri., Mon. or Tues.)	Administer second set of questionnaires to K-6 students.
February 6 – 9	'New fruits' will be offered as part of the breakfast program for the first time (after the questionnaires are administered)
February 6-March 30	'New fruits' will continue to be offered through the breakfast program.
April 2-6 (Any weekday)	Administer third set of questionnaires to K-6 students.
June 11-15 (Any weekday)	Administer fourth set of questionnaires to K-6 students.

APPENDIX C:

Kids Eat Smart Foundation -
School Research Participation Letter

October 5, 2006

Kids Eat Smart Foundation
NEWFOUNDLAND & LABRADOR

To all Principals

Kids Eat Smart Foundation was pleased to launch the *Fruits & Veggies First!* initiative on September 26, 2006 with the Minister of Health and Community Services, Tom Osbourne. *Fruits & Veggies First!* is a special fund that Kids Eat Smart Foundation will allocate to Kids Eat Smart Clubs, along with and in addition to start up, sustaining and matching grants. *Fruits & Veggies First!* is designed to help programs include in their menu a variety of foods from the fruit and vegetable food group in Canada's Food Guide to Healthy Eating.

As part of this initiative, Kids Eat Smart Foundation is partnering with the Faculty of Medicine – Division of Community Health research team in the hopes that a pilot research project may be able to be completed. This would provide an excellent opportunity to gain local statistics regarding children's consumption of fruits and vegetables and as KES likes to take an evidence based approach, we believe it would provide the Foundation with data that will be extremely valuable when requesting government and corporate sponsors to provide funds to continue and further develop this project.

This research project is still in the preliminary stages and as one of the first steps; we need to know how many schools would be willing to participate in this potential study. This research will involve students answering a pre and post survey about fruits and vegetables that is made simple for children and was approved for a similar study previously completed in Prince Edwards Island. Also, other information that may be required is the cafeteria sales (if there is an operating cafeteria in the school), are there retail outlets within walking distance of the schools, and accessibility to fruits and vegetables in the region. It is important to note that some fruits we are intending to incorporate into the research include seedless grapes, kiwi, and cantaloupe. If there are any children in the school with an allergy to any of the mentioned fruits, your school will not be able to participate in this particular study. Also note that the additional cost for printing surveys and so on will be absorbed by the Kids Eat Smart Foundation and will **not** be a responsibility of the schools that participate.

Please forward the response sheet by fax to 709-722-7250 by **October 11, 2006**. Thank you for your cooperation and please contact me if you have any questions. I can be reached at 709-722-1996 or toll free 1-877-722-1996 as well as via e-mail: aedwards@kidseatsmart.ca.

Sincerely,

Annette Edwards, Dietitian Program Development Coordinator
P.O. Box 26009, 95 Bonaventure Place St. John's, NL A1C 5T9

Yes, _____ is willing to
(school name)

participate in the Fruit and Veggies First! research project. There are

_____ students that participate in the Kids Eat Smart Program
(# of children)

on a regular basis. The school population is _____ students.
(# of children)

_____ _____
Principal Signature Date

APPENDIX D:
Sample Student Questionnaire

Kiwi

How much do you like KIWI?

Yucky

Just Ok

Yummy

X

Never Tried

How much do you want to try a KIWI?

Really don't want to try it

Sort of don't want to try it

In between So-So Don't Care

Sort of want want to try it

Really want to try it

APPENDIX E:

Dr. Jennifer Taylor Permission Letter
(to adopt student questionnaire and associated script)

2

UNIVERSITY of PRINCE EDWARD ISLAND

550 University Avenue
Charlottetown
Prince Edward Island
Canada C1A 4P3

To: Human Investigations Committee
Memorial University of Newfoundland

From: Dr Jennifer Taylor, Associate Professor and Chair
Department of Family & Nutritional Sciences
University of Prince Edward Island

October 10, 2006

I am writing to confirm that Dr Barbara Roebothan and the Kids Eat Smart Foundation have my permission to use my "Preference and Willingness to Try Fruits and Vegetables" questionnaires for children, and the accompanying script for research purposes.

Jennifer Taylor

APPENDIX F:
Principal Questionnaire

Instructions

Please answer the following questions to the best of your knowledge as the principal of _____ School. There are no correct or incorrect answers. Answers to all questions will be kept strictly confidential. All data released by researchers will be released as group data with no reference to individual respondents or individual schools. You may wish to consult with volunteers of the Kids Eat Smart (KES) breakfast club and/or participating teachers at your school when you answer these questions.

These questions are being asked of all principals of schools participating in the recent 'new fruit initiative' supported by the Kids Eat Smart Foundation and Memorial University through your school's breakfast club/program. Although your school has agreed to participate in this program you are not personally obligated to complete this questionnaire. Nevertheless, completion of this questionnaire would be extremely helpful to the success of this project.

General Questions

1. What is the total enrollment of elementary students in your school?
   _____ students

2. Is there a retail outlet which is within walking distance to your school which can be visited by elementary students to purchase foods during the school day?

   i) YES _____
   ii) NO _____
   iii)YES, but essentially no students buy food there on school days -
   _____
   iv) I DON'T KNOW _____

Specific Questions

3. What is the AVERAGE number of elementary students who availed of the breakfast program offered through the Kids Eat Smart Foundation at your school PER DAY?

   i) BEFORE the 'new fruit initiative'? (Fall 2006)
   _____ students/day
   ii) TOWARDS THE END of the 'new fruit initiative'? (March 5-9, 2007)
   _____ students/day

4. What is the AVERAGE intake by your school's canteen and/or cafeteria for candy items* PER DAY?

i) BEFORE the 'new fruit initiative'? (Fall 2006)
_____$/day
ii) TOWARDS THE END of the 'new fruit initiative'? (March 5-9, 2007)
_____ $/day
ii) We do not sell candy items* on school premises._____
*Candy items would include any soft or hard candies including chocolate bars, chewing gum and/or fruit leathers and excluding salty snacks such as potato chips, dessert/baked goods and/or soft drinks.

5. Please answer the following questions based on each fruit:

i) On the FIRST day that this 'new fruit' was offered to students in your school (week of January 15th 2007) how many servings were offered to the students IN TOTAL?

Kiwi: _____ serving/day
Cantaloupe: _____ serving/day
Seedless grapes: _____ serving/day

ii) On the FIRST day that this 'new fruit' was offered to students in your school (week of January 15th 2007) how many servings were discarded or thrown in the garbage without ever being tasted?

Kiwi: _____ serving/day
Cantaloupe: _____ serving/day
Seedless grapes: _____ serving/day

iii) On the LAST day that this fruit was offered to students in your school (week of March 5th 2007) how many servings were offered to the students IN TOTAL?

Kiwi: _____ serving/day
Cantaloupe: _____ serving/day
Seedless grapes: _____ serving/day

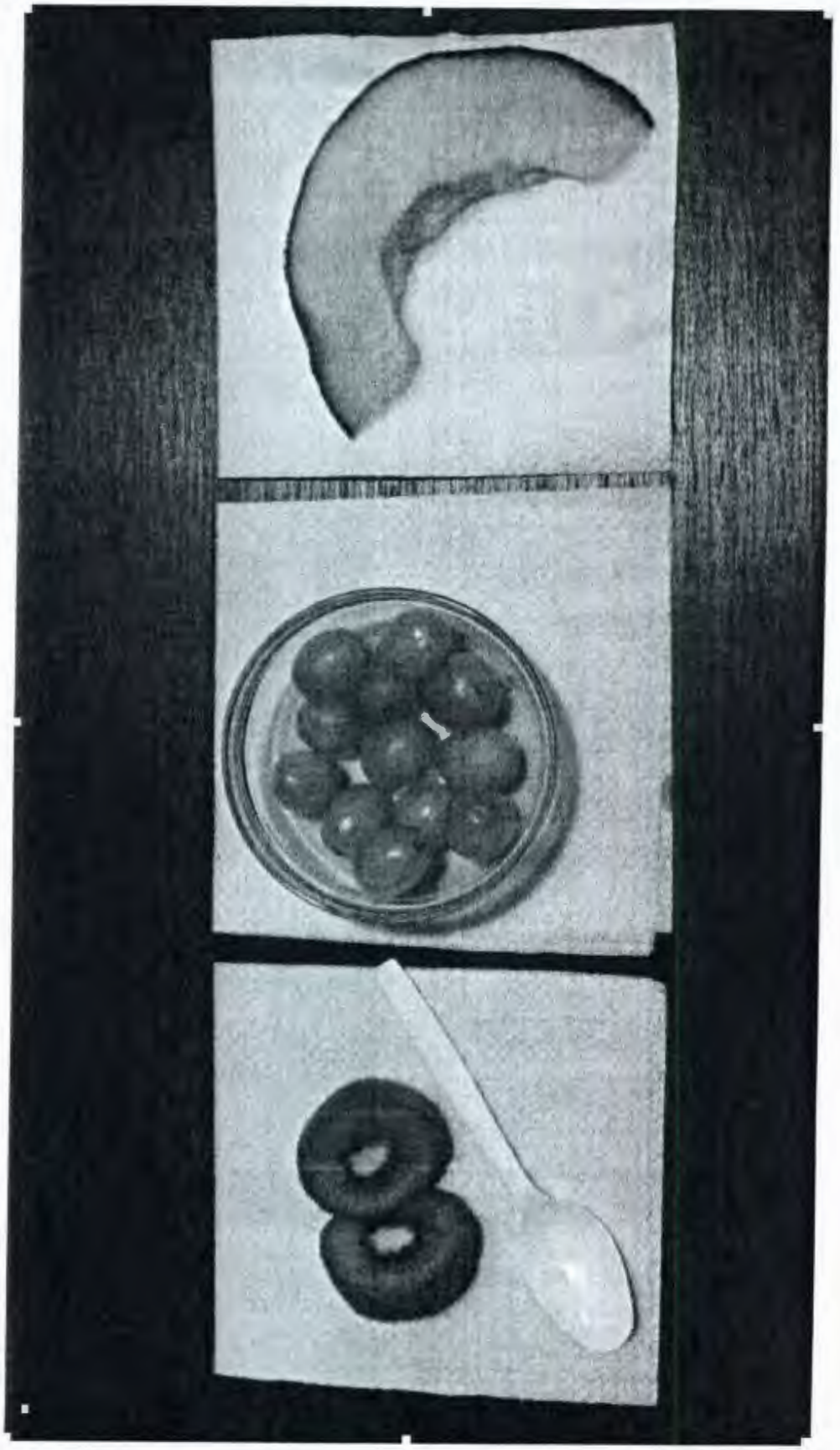
iv) On the LAST day that this fruit was offered to students in your school (week of March 5th 2007) how many servings were discarded or thrown in the garbage without ever being tasted?

Kiwi: _____ serving/day
Cantaloupe: _____ serving/day
Seedless grapes: _____ serving/day

Thank-you!

APPENDIX G:

Test Fruit Pictures



APPENDIX H:

Food Supplier Agreement Form

January 13th 2007

This confirms that I have read the letter of instruction sent to me by the coordinators of the new fruit initiative which is being offered to the children of _____ *(school)* in _____ *(town)* as part of the Kids Eat Smart Breakfast Club. The fruits to be delivered for this purpose are fresh kiwifruit, fresh green seedless grapes and fresh cantaloupe. The dates involved are the week of February 5th to the week ending March 30th inclusive. I understand my role as supplier of foods to this school.

_____ *(Signature)*

_____ *(Date)*

Once the signature and date have been completed please FAX to the Kids Eat Smart Foundation at (709) 722-7250, attention Daphne LeDrew.

APPENDIX I:

KES Letter to Eastern School District
(to conduct the proposed research)

October 14, 2006

Dr. Darin King
CEO/Director of Education
Eastern School District
Suite 601, Atlantic Place
215 Water Street
St. John's, NL A1C 6C9

Dear Dr. King;

We are requesting the support of the Eastern School District for a research project to be carried out by Kids Eat Smart Foundation in partnership with Memorial University Faculty of Medicine – Division of Community Health and Humanities.

On September 26, 2006, Kids Eat Smart Foundation along with the Minister of Health and Community Services, Honourable Tom Osbourne, launched a *Fruits & Veggies First!* initiative. *Fruits & Veggies First!* is a special fund that Kids Eat Smart Foundation will allocate to Kids Eat Smart Clubs, along with and in addition to start up, sustaining and matching grants. *Fruits & Veggies First!* is designed to help programs include in their menu a variety of foods from the fruit and vegetable food group in Canada's Food Guide to Healthy Eating. As part of this initiative, Kids Eat Smart Foundation is partnering with Memorial University Faculty of Medicine – Division of Community Health and Humanities research team to complete a pilot research project. This would provide an excellent opportunity to gain local statistics regarding children's consumption of fruits and vegetables and as Kids Eat Smart takes an evidence based approach, we believe it would provide the Foundation with data that will be extremely valuable when requesting government and corporate sponsors to provide funds to continue and further develop this project.

This research project is still in the preliminary stages and as one of the first steps; we approached schools with existing Kids Eat Smart Clubs, to investigate their willingness to participate in this potential study. There was a great response from schools in every district of this province but at this point, the research team and the Foundation have decided that the study will involve select schools in the Eastern School District. This research will involve students answering a pre and post survey about fruits and vegetables that is made simple for children and was approved for a similar study previously completed in Prince Edward Island. This research will be conducted as part of our pre-established child nutrition programs in schools, the Kids Eat Smart Clubs. Also, other information that may be required includes: the cafeteria sales (if there is an operating cafeteria in the school), whether there are retail outlets within walking distance of the schools, and accessibility to fruits and vegetables in the region. It is important to note that fruits we are intending to incorporate into the research include seedless grapes, kiwi, and cantaloupe. The

schools that have children with allergies to any of these mentioned fruits would not be able to participate in this particular study despite their interest. Any costs for printing surveys or other materials will be absorbed by the Kids Eat Smart Foundation and will **not** be a responsibility of the schools that participate.

We are asking that you complete the enclosed form, which will consent to Kids Eat Smart Foundation and Memorial University working with the schools that will be selected in the Eastern District that have already expressed interest in participating in this research project. This response sheet can be returned to us by fax to 722-7250. Thank you for your cooperation and please do not hesitate to contact me [722-1996 or 1(877)722-1996, aedwards@kidseatsmart.ca] Dr. Roebothan [1(709)777-8387, broeboth@mun.ca], or the Office of the Human Investigations Committee of the Faculty of Medicine, Memorial University [1(709)777-6974, hic@mun.ca] if you have any questions or concerns.

Sincerely,

Annette Edwards, Dietitian
Program Development Coordinator
Kids Eat Smart Foundation

Dr. Barbara Roebothan
Assoc. Prof. of Nutrition and Dietetics
Memorial University

Yes I, Dr. Darin King, CEO/Director of Education for the Eastern School District grant permission for select schools in the Eastern School District that have already expressed interest, to participate in research being undertaken by Memorial University on behalf of Kids Eat Smart Foundation. This research will be specifically on the Kids Eat Smart *Fruits and Veggies First!* initiative.

Dr. Darin King

Date

APPENDIX J:

Principal Willingness to Participate in Study Form

Dear Principal,

Earlier this month, a notification was sent to your attention regarding your interest in a pilot research project which we may potentially conduct at your school. This project will be conducted on behalf of the Kids Eat Smart Foundation (KES) and the Faculty of Medicine – Division of Community Health and Humanities research team in an attempt to increase the consumption of fruits by elementary school children in Newfoundland and Labrador.

This project entails the introduction of a small number of new fruits to the students of your school through the already established breakfast club/program, and to investigate whether the introduction of these new fruits will increase their consumption by students. With the help of KES volunteers, cantaloupe, seedless grapes and/or kiwi fruit will be periodically available at the breakfast program over an eight week period early in the new year. All participating children will be offered the 'new' fruits and encouraged to try them but any child has the option to try or not to try one or more of the fruits on any day or all days. As part of the research process, students will be asked to complete pre-tested questionnaires twice before the fruit is introduced and twice again later in the school year. Each time the questionnaire will ask i) do you like this fruit? and ii) are you willing to try this fruit? We would like to obtain contact names of teachers in your school who may be present at the time of the fruit distribution to ask for their assistance. KES will also be contacting their volunteers at your school for their support. We hope that agreeable teachers and/or KES volunteers will be present to assist the children in completing the questionnaires and to answer their questions. In addition, we will ask you, as the principal of a participating school, to complete a short questionnaire pertaining to factors which may be associated with the students' choice of foods offered at school.

Prior to initiating this project, an in-person and/or telephone information session with principles, teachers and/or KES volunteers will be held upon request. Please acknowledge your willingness to participate on behalf of the school by completing your signature and date of signing below.

Thank-you and we look forward to providing your students with a safe, healthy and fun learning experience.

Sincerely,

Kara Roberts, Principle Investigator
Phone: 709-754-9902
Memorial Ethics Committee Phone: 709 777-6974

_____ _____

Principal's Signature Today's date
(indicating willingness, as representative of school, to participate in project described above)

APPENDIX K:

Program Coordinator Willingness to Participate in Study Form

Dear Program Coordinator,

Your school's principal and a representative of your schoolboard have recently consented for your school to participate in a research project with the Kids Eat Smart Foundation (KESF) and a Faculty of Medicine - Division of Community Health and Humanities research team. The purpose of this project is to attempt to increase the consumption of fruits by elementary school children in Newfoundland and Labrador.

This project entails the introduction of a small number of new fruits to the students of your school through the already established breakfast club/program, and to investigate whether the introduction of these new fruits will increase their consumption by students. Periodically over an eight week period early in the new year, cantaloupe, seedless grapes and/or kiwi fruit will be available in the schools breakfast program. All participating children will be offered the 'new' fruits and encouraged to try them, however the child has the option to try or not to try the fruit on any day or all days. As part of the research process, students will be asked to complete pre-tested questionnaires twice before the fruit is introduced and twice again later in the school year. Each time the questionnaire will ask i) do you like this fruit? and ii) are you willing to try this fruit? In addition, we will also ask principals to complete a questionnaire pertaining to factors which may be associated with the students' choice of foods offered at school.

Since your school has been selected to participate in this study, we request your cooperation and participation in its delivery. For example, as a the program coordinator you may be asked to purchase the selected fruits (using allocated funds from the KESF) from a local grocery store, help to prepare and display these fruit for the students to try, encourage students to try the 'new' fruits, assist them in completing the questionnaires, and/or assist in the collection of the completed questionnaires. Prior to initiating this project in-person, electronic and/or telephone information sessions with yourself, principals, and other interested teachers and KES volunteers will be held upon request.

Healthy dietary behaviours learned early in life have the potential to improve the health and well being of our children. With the help from breakfast club program coordinators we hope to meet this potential by offering a wider variety of foods from *Canada's Food Guide to Healthy Eating* to the students of your school. Please acknowledge your willingness to participate in this project by completing your signature and date of signing below.

Thanks so much and we look forward to providing the students with a safe, healthy and fun learning experience.

Sincerely,

Kara Roberts, Principal Investigator, Phone: 709-754-9902
Memorial Ethics Committee Phone: 709 777-6974

_____ _____

Program Coordinator's Signature Today's date
(indicating willingness, to participate in project described above)

APPENDIX L:

Teacher and KES Volunteer Study Information Letter

Dear Teacher/Volunteer,

Your school's principal and a representative of your schoolboard have recently consented for your school to participate in a research project with the Kids Eat Smart Foundation (KES) and a Faculty of Medicine - Division of Community Health and Humanities research team. The purpose of this project is to attempt to increase the consumption of fruits by elementary school children in Newfoundland and Labrador.

This project entails the introduction of a small number of new fruits to the students of your school through the already established breakfast club/program, and to investigate whether the introduction of these new fruits will increase their consumption by students. Periodically over an eight week period early in the new year, cantaloupe, seedless grapes and/or kiwi fruit will be available in the schools breakfast program. All participating children will be offered the 'new' fruits and encouraged to try them, however the child has the option to try or not to try the fruit on any day or all days. As part of the research process, students will be asked to complete pre-tested questionnaires twice before the fruit is introduced and twice again later in the school year. Each time the questionnaire will ask i) do you like this fruit? and ii) are you willing to try this fruit? In addition, we will also ask principals to complete a questionnaire pertaining to factors which may be associated with the students' choice of foods offered at school.

Since your school has been selected to participate in this study, we request your cooperation and participation in its delivery. For example, some teachers and volunteers who are present when breakfast foods are picked up by the children, will be asked to encourage students to try the 'new' fruit(s) offered on a particular day and/or to assist the students in completing the questionnaires and/or assist in the collection of the completed questionnaires. Prior to initiating this project in-person, electronic and/or telephone information sessions with principals, interested teachers and interested KES volunteers will be held upon request.

Healthy dietary behaviours learned early in life have the potential to improve the health and well being of our children. With the help from both teachers and volunteers we hope to meet this potential by offering a wider variety of foods from *Canada's Food Guide to Healthy Eating* to the students of your school.

Thanks so much and we look forward to providing the students with a safe, healthy and fun learning experience.

Sincerely,

Kara Roberts
Principal Investigator

APPENDIX M:

Parental/Guardian Consent Form

Dear Parent/Guardian,

Did you know that *Canada's Food Guide to Healthy Eating* recommends that children consume at least five to ten servings of fruits and vegetables every day? Statistics Canada suggests that our children are not meeting this recommendation, which in part has lead to a significant increase in obesity rates among Canadian children.

Healthy dietary behaviours learned early in life have the potential to improve the health and well being of our children. With the help of the Kids Eat Smart Foundation (KES), your school is helping to meet this potential by supporting breakfast clubs for its students. In response to growing evidence that children and youth are not consuming enough fruits and vegetables, the KES Foundation has partnered with the Faculty of Medicine - Division of Community Health research team to implement a *Fruits and Veggies First!* initiative. The purpose of this program is to introduce a small number of new fruits to the students through the already established breakfast club, and to investigate whether the introduction of these new fruits will increase the overall acceptance and intake of fruit by students.

With the help of KES volunteers, cantaloupe, seedless grapes and kiwi fruit will be available at your child's school breakfast program periodically over an eight week period early in the new year. All participating children will be offered the 'new' fruits and encouraged to try them but the child has the option to try or not to try the fruit on any day or all days. As part of the research process, your child will be asked to complete pre-tested questionnaires twice before the fruit is introduced and twice again later in the school year. Each time the questionnaire will ask i) do you like this fruit? and ii) are you willing to try this fruit? KES volunteers and teachers will be present to assist the children in completing the questionnaires and to answer their questionnaires.

We welcome your cooperation with this project, however we realize that it is your decision as a parent/guardian to deny your child's participation if you chose to do so. If you are willing for your child to participate (i to be offered cantaloupe, seedless grapes, and kiwi fruit and ii to be asked to complete the associated questionnaires) please sign and return the attached permission form to the school by *November 28, 2006*. Even if you give your child permission to participate, he/she is not forced to do so. Your signed and returned permission slip will allow your child to decide to participate or not.

It should be noted that your child will not be sent home with any questionnaires or food, nor will any further involvement be asked of the parents. On completion of this research, a newsletter outlining the final results will be available at the school and forwarded to parents on request.

Thank-you so much and we look forward to providing your child with a safe, healthy and fun learning experience.

Sincerely, Kara Roberts, Principal Investigator, Phone: 709-754-9902 Email: kararoberts17@hotmail.com

PERMISSION FORM

I, _____, *hereby give permission for my child*
(parent/guardian name)

_____ *to participate in the Fruit Initiative Research*
(name of child)

Project taking place at the Kids Eat Smart Club at _____,
(name of school)

_____ _____
Signature (Parent/Guardian) Date

APPENDIX N:

Student Questionnaire Script

(used by Program Coordinators when administering the student questionnaires)

Script for Fruit Snack Program
Grades K-6

1. Good morning everyone. Today we will be conducting a short survey with students who participate in the breakfast program. Within the next few weeks, there will be a variety of free fruits available at your breakfast program for you to try. This survey will help to tell us what kinds of foods the students eat, especially fruits.

2. Before we get started we need you to put a **secret code** on the piece of paper we gave you.

   Your initials: Ben James Smith: BJS
   Your age: 7
   Boy or Girl: B
   First letter in your Mother's name: J for Joan
   You then write at the top: **BJS 7BJ**

   Refer to overhead or paper.

3. We are going to show you 6 foods. We would like you to tell us how much you **like the foods** by placing a circle around the appropriate face picture.

   Demonstrate: How much do you like ice cream? Circle response. If you haven't eaten the food before or if you don't know what it is, circle X.

   Next, we want you to tell us how much you would be willing to try this food. Demonstrate: How willing are you to try ice cream?

4. We will go through the foods with you and show you a picture of each one and ask you to circle the faces each time. It will take about 10 minutes. Just follow along on your sheets.

5. We sent home letters explaining the survey to your parents. We asked them to call us if they don't want you to take part. So, unless we heard from your parents, we are assuming that you can take part.

   Even though your parents have given your permission for you to take part in the survey, you don't have to participate. Simply leave the questionnaire blank and return it to us at the end. There is absolutely no problem if you don't want to complete it, and your grades won't be affected. You can also withdraw from the survey by not completing the questionnaire.

   We are going to write up a report summarizing everyone's answers. A final copy of that report with all the results will be given to your school. All answers will remain a secret (confidential) and no one will be able to tell what you wrote.

   NOW we will start the survey!

APPENDIX O:

Memorial University

Human Investigations Committee Study Approval Letters

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

October 31, 2006

Reference #06.207

Ms. Kara Roberts
C/o Dr. B. Roebotham
Division of Community Health & Humanities
2nd Floor, Faculty of Medicine

Dear Ms. Roberts:

Your application entitled "**An attempt to increase the consumption of fruits by elementary school children in Newfoundland and Labrador**" was reviewed by the Human Investigation Committee at the meeting held on **October 26, 2006**. The Committee granted approval of the application subject to a response to the following:

1. With respect to privacy and confidentiality, the Committee commented that the unique identifier code was not unique, but because the risk was minimal the Committee agreed this was acceptable.

2. Although the issue of the consent process was clarified with the investigator over the phone with the Co-Chair, the Committee requested written clarification of the statement "Despite the parents' decision, students will be informed on the day of the pre test that it is up to them to complete the questionnaire" confirming that if a parent does not want their child to participant, the child would not be allowed to participate.

The Committee agreed that the response and revised letter to parents could be reviewed by the Co-Chairs and, if found acceptable, full approval of the study be granted.

Please be advised that a response to the aforementioned concerns **is expected within three months of the date of this correspondence.** If we do not receive a response within this timeframe, the file will be automatically closed by the Co-chairs of the Committee.

We look forward to hearing further from you regarding the above outlined issues.

Sincerely,

John D. Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation Committee

St. John's, NL, Canada A1B 3V6 • Tel.: (709) 777-6974 • Fax: (709) 777-8776 • email: hic@mun.ca • www.med.mun.ca/hic

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

November 1, 2006

Reference #06.207

Ms. Kara Roberts
C/o Dr. B. Roebotham
Division of Community Health & Humanities
2nd Floor, Faculty of Medicine

Dear Ms. Roberts:

This will acknowledge your email correspondence dated October 31, 2006, wherein you clarify issues and provide a revised information letter for your research study entitled **"An attempt to increase the consumption of fruits by elementary school children in Newfoundland and Labrador".**

At the meeting held on **October 26, 2006**, the initial review date of this study, the Human Investigation Committee (HIC) agreed that the response and revised information letter could be reviewed by the Co-Chairs and, if found acceptable, full approval of the study be granted.

The Co-Chairs of the HIC reviewed your correspondence, approved the revised information letter and, under the direction of the Committee, granted ***full approval*** of your research study. This will be reported to the full Human Investigation Committee, for their information at the meeting scheduled for **November 9, 2006.**

Full approval has been granted for one year. You will be contacted to complete the annual form update approximately 8 weeks before the approval will lapse on **October 26, 2007**. It is your responsibility to ensure that the renewal form is forwarded to the HIC office not less than 30 days prior to the renewal date for review and approval to continue the study. The annual renewal form can be downloaded from the HIC website http://www.med.mun.ca/hic/downloads/Annual%20Update%20Form.doc.

Modifications of the protocol/consent are not permitted without prior approval from the Human Investigation Committee. Implementing changes in the protocol/consent without HIC approval may result in the approval of your research study being revoked, necessitating cessation of all related research activity. Request for modification to the protocol/consent must be outlined on an

amendment form (available on the HIC website) and submitted to the HIC for review.

For a hospital-based study, it is **your responsibility to seek the necessary approval from the Health Care Corporation of St. John's and/or other hospital boards as appropriate**.

This Research Ethics Board (the HIC) has reviewed and approved the application and consent form for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations. The membership of this research ethics board complies with the membership requirements for research ethics boards defined in Division 5 of the Food and Drug Regulations.

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

We wish you every success with your study.

Sincerely,

John D. Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation Committee

JDH;RSN\jed

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

November 23, 2006

Reference #06.207

Ms. Kara Roberts
C/o Dr. B. Roebotham
Division of Community Health & Humanities
2nd Floor, Faculty of Medicine

Dear Ms. Roberts:

This will acknowledge your completed amendment dated November 17, 2006 wherein you provide an amendment, dear parent/guardian letter, permission form, dear program coordinator letter and approval letter from Eastern School Board for your research study entitled **"An attempt to increase the consumption of fruits by elementary school children in Newfoundland and Labrador"**

The Chairs of the Human Investigation Committee have reviewed your correspondence, acknowledges receipt of the approval letter from Eastern School Board and granted approval of the amendment, dear parent/guardian letter, permission form, dear program coordinator letter, as submitted. This will be reported to the full Human Investigation Committee, for their information, at the meeting scheduled for **December 7, 2006.**

This Research Ethics Board (the HIC) has reviewed and approved the amendment for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations. The membership of this research ethics board complies with the membership requirements for research ethics boards defined in Division 5 of the Food and Drug Regulations.

Sincerely,

Richard Neuman, PhD
Co-Chair
Human Investigation Committee

John Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

RN;JH\jd

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ

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APPENDIX P:
Eastern School District Approval Letter
to Conduct the Proposed Research

Eastern School District

Chair: Milton Peach
C.E.O./Director of Education: Darin King, Ph.D

2006 11 20

Ms. Kara Roberts
69 Neptune Road
St. John's, NL
A1B 4J2

Dear Ms. Roberts:

I have reviewed your correspondence requesting permission to do research in the Eastern School District, related to your study entitled: "An Attempt to Increase the Consumption of Fruits by Elementary School Children in Newfoundland and Labrador". This study will be coordinated in schools with pre-existing breakfast programs for the Kids Eat Smart Foundation.

I am pleased to approve your request. Permission is hereby granted for you to contact schools containing elementary-aged children in the Eastern School District for the purposes outlined in your proposal subject to the following:

1. You meet all the requirements as set forth by Tri-Council Ethics Committee for Research on Human Subjects (specifically K-12 students).
2. You obtain the written permission of the school principal of the schools (s) where the study is to take place.
3. You obtain the written permission of all teachers who will be facilitating with the study.
4. You obtain written permission from parent(s) of each participating student and inform them of their right (and their child's right) to withdraw from the study at any point in the process.
5. Participation by schools, teachers, and students is completely voluntary.
6. You meet with the Principal of each participating school to discuss student allergies. Where allergies exist to any of the proposed fruits, these fruits will not be permitted to be part of the study and shall not be brought into the school.
7. In all aspects of the study, confidentiality and anonymity of each student, class and the school is to be maintained to the fullest extent possible.

I wish you every success with your study.

Sincerely,

Janet Vivian - Walsh

JANET VIVIAN-WALSH
Senior Education Officer (Programs and Pupil Services)

/ee

Suite 601, Atlantic Place, 215 Water St., Box 64-66, St. John's, NL A1C 6C9
Telephone: (709)758-2372 Facsimile: (709)758-2706 Web Site: www.esdnl.ca

APPENDIX Q:

Oath of Confidentiality and Preservation of Confidentiality Statement

Oath of Confidentiality & Preservation of Confidentiality

I understand that as an investigator or member of a research team, I must maintain strict confidentiality of information obtained from participants in research studies and/or their health and study records.

I understand that not all members of a research team will require confidential information about research participants and that the principal investigator will limit the number of persons on the team who require such information to as few as possible.

As an investigator I agree not to disclose or discuss any confidential information to which I have access except with the appropriate members of the research team.

I understand that a failure to abide by this requirement could cause individual participants embarrassment. Breach of confidentiality could have serious personal, social and legal consequences for the participant and for the participant's family, friends and associates. I appreciate that an unauthorized disclosure could have consequences for the participant in his or her employment.

I also acknowledge that as part of my employment relationships, if I should make an unauthorized disclosure of information about a participant in a research study, I may be dismissed from my position or suffer formal reprimand. I appreciate that I shall be legally responsible for my actions and, in the event of litigation for my unauthorized disclosure of information, I agree to indemnify my employer for any damages incurred by him.

Printed name of research team member: Kara Danielle Roberts

Position on the research study:

[X] Investigator
[ ] Staff member

Signature of research team member: *Kara D. Roberts*

Witness name: Sarah Day

Witness signature: *Sarah Day*

Date: December 05, 2006

APPENDIX R:

Table 12

Table 12

Test fruits - Change in Liking Scores from Time 1 to Time 2, as Reported by the Student Questionnaire (results of the Paired t-Test)

Test Fruit	n (%)[a]	Time	Liking Score[b]	SD[c]	t value[d]	p value[e]
Kiwifruit	251	Time 1	2.65	0.641	-1.732	0.084
		Time 2	2.72	0.596		
Cantaloupe	174	Time 1	2.35	0.789	-1.997	0.047*
		Time 2	2.47	0.788		
Grapes	299	Time 1	2.9	0.343	-1.266	0.206
		Time 2	2.93	0.319		

a Represents the percent of students who answered the question "How much do you like this fruit?" with time of the total number of students who completed surveys at time 1 and time 2 (N= 325; 100%).
b Liking score = mean; measure on a three point scale where 1='yucky', 2='ok' and 3= 'yummy'
c SD = Standard Deviation
d t value = t or probability distribution (t will be negative if the second mean is larger than the first mean and positive if it is smaller)
e p value ≤ 0.05 is taken to be significant; * indicates significance

APPENDIX S:

Table 13

Table 13

Proportion of Students Reporting they were Willing to Try Cantaloupe to those reporting they had Actually Tasted Cantaloupe at Time 1 and Time 2 (results of the Chi-Square Test)

	Time 1[c]		**Time 2**[d]	
Variable[a]	Never Tasted[b] (%)	Actually Tasted (%)	Never Tasted (%)	Actually Tasted (%)
Not Willing to Try	58.5	41.5	29.7	70.3
Willing to Try	35	65	10.1	89.9

a 'Not willing try' indicates the students responding 1 or 2 on a five point willingness to try scale; 'willing to try' indicates the students responding 4 or 5 on a five point willingness to try scale.
b 'Actually tasted' indicates the students responding 'yucky, just ok or yummy' to the question 'how much do you like this fruit?'; 'never tasted' indicates the students responding 'never tried' to the question how much do you like this fruit?
c At time 1, the association between the variables willing to try and tasted is significant, x^2 (1, n=265) = 11.94, p=0.001, phi = 0.22.
d At time 2, the association between the variables willing to try and tasted is significant, x^2 (1, n = 269) = 15.45, p= 0.00, phi = 0.25.