

NutriSTEP[®] Implementation and Results of Preschooler Eating and Activity Habits in the Thunder Bay District

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TABLE OF CONTENTS

Executive Summary	4
Rationale.....	4
Main Findings.....	4
Recommendations	6
Background	8
Literature Review	8
1. Physical Growth	8
2. Food and Nutrient Intake.....	10
3. Factors Affecting Intake and Eating Behaviour	12
3. a. Feeding Environment	12
3. b. Food Insecurity.....	13
4. Physical Activity and Sedentary Behaviour.....	15
Methods	17
Implementation of NutriSTEP® in Thunder Bay	18
Data Collection and Response Rate	20
Findings	20
Section 1: Physical Growth	21
Section 2: Food and Nutrient Intake	21
Section 3: Factors affecting intake and eating behaviour.....	24
Section 4: Developmental and Physical Capabilities	24
Section 5: Physical Activity.....	24
Limitations	26
Discussion	27
Conclusion	30
Recommendations	31
References	32

Executive Summary

Rationale

Children's food choices directly affect their growth and development, health behaviours, and learning performance. Eating habits and patterns are established at an early age and preschoolers are especially vulnerable to the impacts of poor nutrition (Randall-Simpson et al, 2008). Nutrition risk screening can offer many benefits to children and their families by:

- Raising awareness and knowledge about healthy eating, healthy weights and physical activity
- Promoting early intervention and decreasing the risk of serious nutrition consequences such as anemia and overweight/obesity
- Targeting children at risk for further assessment and treatment
- Streamlining the referral process and prioritizing services to those most in need
- Identifying the needs in a population group to integrate services and target nutrition programs. (NutriSTEP[®] Toolkit)

NutriSTEP[®] stands for Nutrition Screening Tool for Every Preschooler. It is a scientifically valid and reliable, bilingual (English and French) 17-item nutrition risk screening questionnaire. This parent-administered tool covers five components believed to influence the nutrition status of preschoolers, 3-5 years of age. The tool was added to the JK screening booklet that is distributed by Fair Start in the district of Thunder Bay in 2009. Approximately 1100 tools were distributed and 664 were returned to the health unit for analysis. Though there were challenges to adding the tool to the booklet in the district the implementation was relatively seamless. Parents were pleased with the tool and felt that it increased their awareness of nutrition related issues and they appreciated the educational resources provided to them.

Main Findings

The vast majority of children scored low risk (84%), 11.6% were at moderate nutritional risk, and 4.2% scored high. Parents calculated the score incorrectly in 9% of the cases (n=59). In the majority of cases (69%) parents incorrect estimations were due to under estimated the scores, with 31% overestimating the score. This highlights the need to reinforce with facilitators to re-score the tool before following through with the referral process. In a couple of circumstances the NutriSTEP[®] coordinator found upon recalculation that children were actually at high and not moderate risk and thus required a referral. There was a fairly even split in the sex of the children with 355 (53.5%) boys and 290 (43.7%) girls. The majority of children were three (53.2%) and four years old (41.4%), with a small number (1.4%) being five. Level of risk did not appear to be associated with either gender (p=0.140) or age.

The majority of parents (98.3%) were comfortable with the way their child is growing. Similarly, 94.9% of parents thought their child was at an appropriate weight. Few parents were concerned their child either needed to gain weight or lose weight (2.4%, n=16).

No significant correlation was found between growth and either physical activity (p=.041) or sedentary behaviour (p=.0698). Parents who were okay with the way their child was growing felt that their child's weight was appropriate (p=.000). Parents who felt their child was at an appropriate weight also felt that their child was getting enough physical

activity ($p=.003$). If a parent felt their child was not at a healthy weight they were more likely to feel their child needed more physical activity ($p=.003$).

A number of questions in the tool focus on a child's intake based on the food groups outlined in Canada's Food Guide to Healthy Eating. Not surprisingly, children were likely to eat grain and milk products more than twice a day 97% of the time. Fruit intake was notably good with 88.9% of children having fruit at least twice a day. When reviewing the results of the meat and alternatives food group children had these foods at least two times a day, 71% of the time. Vegetable intake was the poorest with only 66.7% of children having vegetables at least two times a day.

Parents were asked how often their child had "fast food". Results revealed that 21% or approximately one in five children have fast food at least once a week, with 42% of preschoolers having fast food a few times in a month. When it comes to the pattern of preschooler eating, most eat 3-5 times a day (86.9%) and some (11.9%) eat more than 5 times a day. A small number ($n=7$, 1%) reported eating only twice a day. Although 37.7% (11.7%) of parents reported their child never or rarely takes a vitamin supplement more than 50% reported that their children had supplements at least sometimes.

When the data was analyzed by risk level, parent responses showed that children in the high risk category were more likely to eat less meat, fruit, milk, and vegetables but not grain products than those who were rated as low risk. When it came to fast food consumption 15.6% of children in the moderate risk category were having it sometimes or most of the time, compared to the high risk group with 39.1%.

Food insecurity, or worrying about having enough money to buy food was a concern most of the time for 2 respondents (0.3%), but 48 (7.2%) felt that sometimes it was difficult for them to buy food to feed their child because food is expensive. While 92.5% of parents did not express concern about financial barriers to feeding their children it is essential that we consider the 7.2% of children in our sample who noted food insecurity and the potential nutrition related consequences.

When looking at whether difficulty buying food had an impact on children's consumption of foods from the food groups there were no statistically significant differences in, vegetable, milk or meat consumption for families who had difficulty buying food. However, fruit intake seemed to be impacted at $p=.05$ level.

When asked about how often children are allowed to decide how much to eat, parents let their children decide always 22.5%, most of the time 42%, sometimes 27.9%, rarely 5.7% and never only 1.4% of the time. Children were reportedly not hungry at meal times because they drink all day in 18.4% of the cases. Parents told us that 41% of preschoolers do eat in front of the TV sometimes, although 7.4% eat in front of the TV most of the time. There was not a significant relationship between a child's ability to control what they eat and television watching ($p=0.413$). Those in the high risk category were more likely to eat less than two times a day, and drink fluids throughout the day and not eat a sufficient amount at meal time. Parents let children control their eating less in the high risk category with 14.3% of children never able to control their own eating. Difficulty buying food due to its cost seems to have a direct link to risk level. Parents of children in the high risk category were more likely to have concerns around being able to purchase food due to its cost.

The results from this survey show that few parents are concerned about problems with chewing, swallowing, gagging or choking when their children are eating. Eighty five percent never have concerns, 12% rarely have concerns and only 2.4% sometimes are concerned with their child's physical capabilities around eating.

Most of the parents (90.1%) in our sample think their preschooler is getting enough physical activity. Yet, a third (33.5%) of our preschoolers have more screen time (3 or more hours a day in front of TV or computers) than is recommended. Note that more than 40% are spending at least two hours a day in front of screens. As expected, we found a statistically significant relationship ($p=.000$) between a decrease in physical activity and an increase in sedentary behaviour. Another interesting association that was found noted that fruit intake was lower in those who were less physically active ($p=.000$). Though there was not a statistically significant difference for vegetables the p value was .007. There was not a strong correlation between fast food and sedentary activity. Other studies suggest that there may be a correlation and suggest that those who are more sedentary may be more likely to eat fast food.

Eating meals in front of the television was reportedly higher in those children categorized as high risk with almost one-quarter of them eating in front of the television most of the time (21.4%) or always (3.6%). When it came to physical activity 60.7% of parents of high risk children felt they were not getting enough activity compared to 3.9% for low and 29.9% for moderate risk preschoolers. Parents were more likely to be concerned that a child was not growing well if they were rated as high risk with 14.3% of parents concerned. Parents of children in the high risk category were more likely to feel that their child needed to weigh more or less.

Recommendations

Implementation of the NutriSTEP® Tool

1. Continue to implement NutriSTEP® along with the JK booklets distributed by the Fair Start program through the school boards in all of the district communities.
2. Provide updated training to screeners and emphasize the need to recalculate the scores.
3. Continue to collect data from the tool and input into the established database so that comparisons can be made from year-to-year.
4. Consider approaching family physicians and nurse practitioners to implement the tool in their practices, perhaps begin by approaching family health teams in city and district.
5. Health organizations that provide care to families with preschoolers need to ensure that providers have the knowledge and skills to support parents to provide healthy eating and physical activity information
6. Share research findings with all programs related to preschool including the school board administration and (JK teachers), Best Start hubs, public health nurses in city and district offices.

Eating Habits

1. Focus messaging to parents of preschoolers around strategies to increase meat and vegetable consumption, focus on getting nutrients from food versus supplements, to decrease fast food intake, eating in front of the television, and drinking caloric beverages between meals.
2. Work with parents to practice more participative parenting that involves children having control over what they eat – this could be done with other parenting programs being implemented in the community such as *Triple P®*.

3. Advocate for adequate incomes and food subsidies that allow families to purchase healthy food including vegetables and fruit (ie. Through support of the Good Food Box program).
4. Promote collaborative efforts between public health and other social service agencies to improve the food availability in daycares, schools, recreation facilities and grocery stores.
5. Implement nutrition education strategies that target both parents and children to prevent incorrect information being taught to children.

Activity Habits

1. Increase access to quality physical activity through preschool programs that might include training staff (at licensed daycares and Best Start Hubs) in the area of physical literacy.
2. Advocate for policy and infrastructure changes that impact the way neighbourhoods are constructed to support active transportation and safe outdoor play.
3. Target promotional campaigns on decreasing screen time to less than two hours a day for preschoolers – especially in winter months.

Background

Children's food choices directly affect their growth and development, health behaviours, and learning performance. Eating habits and patterns are established at an early age and preschoolers are especially vulnerable to the impacts of poor nutrition (Randall-Simpson et al, 2008). Nutrition risk screening can offer many benefits to children and their families by:

- Raising awareness and knowledge about healthy eating, healthy weights and physical activity
- Promoting early intervention and decreasing the risk of serious nutrition consequences such as anemia and overweight/obesity
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NutriSTEP[®] stands for Nutrition Screening Tool for Every Preschooler. It is a scientifically valid and reliable, bilingual (English and French) 17-item nutrition risk screening questionnaire. This parent-administered tool covers five components believed to influence the nutrition status of preschoolers, 3-5 years of age. Parents receive a score for the tool which rates their child as either low (<20), moderate (21-25) or high risk (>26). These components: physical growth, food and nutrient intake, physical and developmental capabilities, factors affecting intake and eating behaviour as well as, physical activity and sedentary behaviour, are used to frame the literature review below. Children's food choices directly affect their growth and development as well as health and academic performance. In order to identify and prevent nutrition problems early on this tool is being implemented in various communities in the province, including Thunder Bay. This is the first year of universal screening for children entering Junior Kindergarten (JK). We have used this information to develop a baseline of data.

Child health screening using a valid and reliable screening tool such as NutriSTEP[®] is a requirement within Ontario Public Health Standards (2008). This tool is thus delivered through public health units. Therefore, models suitable for implementation within Public Health are a priority; and what we have learned as one of the early adopters of NutriSTEP[®] may be useful to other dietitians and health professionals in the province. It also provided an opportunity to develop a community baseline for eating and activity habits in children 3-5 years old in the Thunder Bay District. The need for baseline data stemmed from the Thunder Bay District Health Unit (TBDHU) Healthy Weights Strategy and the increased emphasis on surveillance data embedded in the Ontario Public Health Standards. The data will be used to help health unit staff develop future programming and address the needs of preschoolers and their families in our district.

Literature Review

1. *Physical Growth*

Growth is often used as an index for child health and development (NOPCHS, 2003). Optimal growth depends on genetics, absence of chronic disease, adequate nutrition

and a nurturing environment (CPS/DC statement, 2004). Standardized tools such as the Center for Disease Control (CDC) growth charts have been established to measure child growth, including the development and use of a Body Mass Index chart for children (CPS/DC statement, 2004). Monitoring BMI for children older than 2 years has its benefits because it can then be used as a tracking tool into adolescence and onward to adulthood (NOPCHS, 2003).

At present national or provincial surveillance for growth and nutritional status of Canadian children is lacking. Despite this, many of the current statistics suggest childhood overweight and obesity is on the rise. In fact current estimates predict 30% of children in Canada are overweight (>85%ile) or obese (>95%ile) (Veugelers & Fitzgerald, 2005, He, M. & Sutton, J, 2004). Data from the recent Canadian Community Health Survey (Shields, 2004) which included measured heights and weights found, for children aged 2- 5 years, 13% were classified as overweight and 6% as obese. This number is similar to the data collected by Stroud et al (2007) where they noted 8% of preschoolers were at risk of being overweight (BMI> 85% < 95%ile), 12% were overweight and 4% were classified as underweight (BMI< 5%ile). With the increased concern over excess weight in children we must also consider some children struggle with being underweight. Underweight may be associated with inadequate caloric intake for growth, nutrient deficiencies and other underlying chronic conditions (NOPCHS, 2003).

An even higher prevalence of overweight has been noted for children (2-19 years) from First Nations communities (Hanley, et al., 2000) with 27.7% of boys and 33.7% of girls being overweight. CCHS (Shields, 2004) data found the prevalence was higher for Aboriginal children with numbers showing children aged 2- 17 were overweight (21%) or obese (20%). Other Canadian researchers compared prevalence rates for a group of Cree Preschool children aged 5 years and provided reasoning for why rates may differ (Willows, N.D, 2007). Willows and colleagues suggest the measurement reference points used namely either International Obesity TaskForce or Center for Disease Control standards, may over or under-represent the prevalence rates and that it is important for researchers to consider using the same standards when tracking patterns.

Overweight in preschool children is a concern due to potential health consequences including increased risk for cardiovascular, psychosocial, orthopedic and gastrointestinal health not to mention an increased risk for adult obesity and its associated morbidities (NOPCHS, 2003, Guo et al, 1994). Due to the severe consequences of adult obesity, the prevention of obesity in early childhood should be a key priority for public health professionals.

Stang et al, 2004 suggest that 30-60% of body weight is caused by environmental factors and that increased parental adiposity, low parental education, infant feeding patterns, childhood diet and time spent in sedentary behaviours may contribute to overweight in children. Further research suggests sex, gestational age and birth rank, breastfeeding, mothers smoking status during pregnancy, and family income may be factors that are linked to childhood weight (Dubois & Girard, 2006). In fact Dubois and Girard's (2006) findings indicate weight gain at 4.5 years was almost double for children whose mother smoked during pregnancy and for those who gained the most weight between birth and 5 months of age. They also noted parental overweight or obesity increased the odds of being overweight, as did being raised in both middle and low-income families.

One study found that of 3-5 year old children entering school in Chicago, 24% were overweight; a number more than double the present national prevalence in the U.S. for 2-5 year olds (Mason, et al, 2006). Data on preschoolers in Greece found differences in

size existed between boys and girls with boys being taller than girls at all ages, but heavier only for the age period from 1- 3 years (Manios, Y. 2006). Manios (2006) found no significant differences between the gender groups in relation to prevalence of overweight or being at risk of being overweight.

It is interesting to note some parents may perceive their child to be of normal weight when their child is actually overweight. This was found to be the case in the United States in research conducted through Women's, Infants and Children programs. Mothers were noted to be offended by the suggestion their child was overweight and believed that their child would grow out of the problem (Jain, A., et al, 2001). There was also a shared distrust of growth charts by mothers in this sample. Mothers were concerned about their child's weight if they became inactive or were being teased by their peers (Jain, et al, 2001).

Summary – Growth is used as an indicator of child health and development. Optimal growth requires a combination of genetics, nutrition and a nurturing environment. Growth charts are used to measure child growth, and tracking of BMI has indicated overweight and obesity in children has risen especially in First Nations children. Overweight can have potential health consequences including increased risk of adult obesity, cardiovascular psychosocial and gastrointestinal complications. Further, environmental factors play a role in child weight; some may stem back to the prenatal period. Underweight may also be a concern for children but poor nutrient intakes are possible across all weight categories and can have health consequences.

2. Food and Nutrient Intake

Preschoolers' nutritional status can have a direct impact on their health and development. Nutrient deficiencies for instance, can have an impact on child behaviour and learning. For instance, iron deficiency anemia among preschoolers remains relatively high in some areas in the United States (Schneider et al, 2008). Children with iron deficiency anemia were less likely to look toward their mothers, moved closer to their mothers more quickly, and were slower to display positive affect when touching toys for the first time (Lozoff et al, 2007). Others have noted vitamin D deficiency is common in children especially in winter (Newhook et al, 2009). Increasing intake of micronutrients through the addition of fresh fruit to the diet of primary school students in a remote aboriginal community improved hearing (due to a decrease in otitis media infections), and led to a decrease in antibiotic prescriptions for skin infections. At baseline the children participating all had low vitamin C and iron values suggesting poor nutrition may be leading to increased infection rates (Jones & Smith, 2006)

Although there is no national data on nutrient intakes for preschoolers specifically, Statistics Canada released data for children aged 4 – 18 years (Garriguet, 2004). Grain products are a top energy provider for children, supplying 31% of calories. The "other" food category ranks second, providing 22% of calories for children despite the Food Guide recommendation to limit these foods. The most commonly listed foods that comprise the "other" food list include soft drinks, salad dressing, sugars, oils/fats. For 4-8 year old children the results showed seven out of 10 children did not eat the recommended five vegetable and fruit servings a day. Children are doing better with their milk product consumption, on average meeting recommended number of daily servings. However, more than a third of children aged 4-8 years do not have the minimum recommended two servings a day. A higher calcium intake has been linked to an increase in child height. This was particularly the case with fluid milk consumption

and not associated with other dairy products. Protein intake did not have a positive effect on child height (Wiley, A, 2009).

Fast food consumption has risen over the past couple of decades. In the CCHS data, 19% of children 4-8 years old consumed food prepared at a fast food restaurant on the day before the interview (Garriguet, 2004).

During the validation of the NutriSTEP™ tool diet histories and measured heights and weights were collected for children (n=254) in the province of Ontario. From this research only fibre, potassium and vitamin K intake were below the levels for Adequate Intake (AI). For manganese and zinc they found children had intakes above the Tolerable Upper Limits (TUL's) (Stroud et al, 2007). For zinc in particular there was a zero prevalence of inadequacy. The children above the TUL seemed to have higher protein and energy intakes rather than consuming more zinc fortified foods (Hennessey-Priest et al, 2008). Stroud and colleagues (2007) also found a correlation between mean energy intakes above the estimated energy requirements and a higher prevalence of risk for being overweight. Further analysis of the NutriSTEP™ validation data explored folic acid intake and concluded folic acid fortification in the food supply helps to ensure dietary adequacy as all study participants ate folic acid fortified foods (Hennessey-Priest, et al, 2008). Analysis of fruit juice intake was undertaken with the children involved in the validation study, to determine potential association between intake and weight (Rysdale, et al, 2009). No association was found with fruit intake and children's BMI. Some research (O'Mara, L., 2008) has indicated preschoolers who are regular consumers of sugar sweetened beverages are at increased risk for overweight (15% versus 6.9% for non-consumers). However when researchers looked at 100% fruit juice, intake did not appear to be associated with children's BMI.

Gender differences in intake were noted in a study of Greek preschoolers (Manios, 2006), with boys older than 2 years eating a higher number a calories than girls. Similarly boys ate more dietary fat, saturated fat, carbohydrates and protein than girls in the same age groups.

The Canada's Food Guide to Healthy Eating (2007) outlines a food eating pattern that if followed ensures children receive adequate nutrients to provide the recommended nutrient intakes for children leaving supplements largely unnecessary (Leung et al, 1984). Vitamin and mineral supplement intake use among preschoolers in Canada has not been investigated. However, in the US as many as 46% of preschoolers are estimated to use such supplements (Rock, 2007).

Picky eating is a term often used with preschool children. One study that questioned parents, of children aged 2.5, 3.5 and 4.5 years old, found picky eaters consume fewer total fats, less energy and protein. These children were also more likely to consume less than dietary recommendations for fruit and vegetable and meat and alternatives. The opposite scenario existed in this study for parents who felt their child was an overeater (Dubois, et al. 2007). One third of mothers in a study in Australia found mothers had concerns with their child's irregular eating with 7.6% often concerned. Irregular eaters were more likely to have persisting feeding problems, sleeplessness, behavioural problems and lived with mothers with perceived poor physical or mental health (McDermott et al, 2008).

Summary – Preschoolers nutrient intake have a direct impact on their health and development both in the short and long-term. Presently, Canadian children eat adequate amount of grains, and significant amount of other foods including soft drinks, salad dressing and sugars. Not all children are getting the recommended amount of

vegetables and fruits, (70%), nor the milk products (33%). Fast food consumption is on the rise, with 19% of 4-8 year olds eating fast food in the day before the study interview (Garriguet, 2004). Few nutrient inadequacies exist in children though fibre, potassium and vitamin K have been suggested in an Ontario sample. Regular consumption of sweetened beverages has been associated with an increase in overweight, where 100% juice consumption has not. Picky eating has been linked to poorer consumption of fruit, vegetables, and meat products.

3. Factors Affecting Intake and Eating Behaviour

A child's eating behaviour and ability can be influenced by many things including potential physical, medical and dietary issues some of which may include: food allergies, special diet requirements, oral motor and swallowing problems. As well, there are environmental influences on a child's eating pattern such as parental role modeling, division of responsibility in the feeding relationship, food preferences and family mealtime routines (NOPCHS, 2003). A discussion of developmental capabilities and chronic health issues are beyond the scope of this report. Two factors that will be further expanded upon include the role of the feeding environment in establishing child feeding behaviours, and food insecurity.

3. a. Feeding Environment

Children's eating habits are influenced by the family feeding environment (Campbell et al, 2006) where they grow up. Parental food preferences and beliefs, children's food exposure, role modeling, media exposure, peer influence and parent-child interactions around food all play a role in developing child eating habits and may play a role in the development of obesity (NOPCHS, 2003; Taylor et al, 2005). Mothers have been noted to be key players in preventing childhood obesity because they play such a large role in shaping the eating and activity of their children (Moore et al, 1991). Peers are an important and lasting influence on preschoolers' food preferences and their willingness to try new foods (Hendy & Raudenbush, 2000). Parents also play a significant role in the development of food preferences ultimately by providing certain foods rather than others, and by acting as role models of eating behaviour (Savage et al, 2007).

Tucker and colleagues (2006) outline many of the challenges to providing a healthy diet and active lifestyle faced by parents of preschoolers. At the top of the list was time. Parents struggle to ensure children are active in structured sporting activities and receive a healthy meal. Some admitted to choosing between physical activity and healthy eating and resorted to fast food restaurants frequently (Tucker et al, 2006, p. 69). Other parents emphasized the importance of being prepared with a well stocked refrigerator to ensure healthy meals could be made in time. In order to facilitate healthy choices by their preschoolers, parents admitted to using bribery, education, development of boundaries and creative solutions. Of concern was the use of bribery with unhealthy foods to get children to eat healthier options. Researchers also noted parents often passed on incorrect nutrition information to their child, thus indicating the need for education for both parent and child. Preparing healthy food with various shapes, colours and configurations was used as a creative way to make food more appealing to children and encourage healthy eating.

Product marketing has been shown to influence food preferences, food purchases and children's food requests. This is particularly the case with television and preschoolers.

Food advertising has been shown to increase consumption of less healthy, higher-fat, energy dense snacks (Borzekowski, & Robinson 2001).

The physical environment can play a significant role in what preschoolers eat whether they are at home, in childcare, kindergarten or out in the community. With the increased availability of low nutrient, high energy foods, children are increasingly exposed to unhealthy options in large portion sizes (Taylor, 2005).

Parenting style, namely permissive parenting, has been linked to inappropriate snacking, and consumption of inappropriate portions of energy dense foods (Taylor et al, 2005). Parent nutritional knowledge has been linked to the purchase and availability of healthy foods (Contento et al, 1993). Parenting style was investigated in a study by Orrell-Valente and colleagues (2007) where they suggested parents may be inadvertently encouraging children to eat past their internal hunger and satiety cues by insisting they eat “a bit more”. In their study of parents they found 85% of parents tried to get their child to eat more at dinnertime, with 83% of the children having more, and 38% eating moderately or substantially more. Mothers were found to use different tactics than fathers: fathers used pressure tactics with boys and mothers used praise for girls to encourage increased consumption (Orrell-Valente et al, 2007). Interestingly, mothers reported significantly greater weight concern and reduced pressure to eat towards heavier than thinner children within families (Keller, et al, 2006). Certain mother child feeding patterns may promote childhood overweight or disordered eating. One study showed children given less food choice by their mothers were likely to have a lower BMI (Faith et al, 2003).

Providing food is often an emotional issue for mothers of preschoolers. Mothers who were more concerned about their young child being underweight had increased stress around their children’s eating (Pagnini, et al, 2007). One review of literature suggested parental feeding restriction (i.e. Withholding second helpings) rather than general feeding control was more likely to report a positive association with child eating and weight status. Parents reported differences in feeding with siblings. They said they used more restrictive feeding practices with children who were fussier and desired to drink more than their sibling. The same was true if a sibling was slower to eat, emotionally under-ate, enjoyed food less, and was more responsive to internal satiety cues (Farrow, et al, 2009). Parental history with eating disorders and a parent being born outside of the US, were correlated with a higher level of restriction in eating for daughters but not sons (Duke, et al, 2004).

The family eating environment has changed significantly in the past few decades. More parents are working outside of the home, many of them full-time having a significant impact on the family life and meal structure. Some argue (Kime, 2009), family eating behaviours have become more haphazard and less ordered. Those families with less ordered eating habits were more likely to have an overweight child. Current evidence from a literature review supports the hypothesis that parenting and its effects on children’s eating habits may be linked to the development of childhood obesity. Similarly there is evidence child eating habits and weight may influence parenting (Ventura & Birch, 2008).

3. b. Food Insecurity

Food insecurity can be defined as lack of access to nutritious food through socially acceptable means (McIntyre et al, 2003). Children of younger ages seem to be more protected from poor diets in households with limited access to food (Glanville & McIntyre, 2006) and are less likely to experience nutrient inadequacy (Kirkpatrick &

Tarasuk, 2008). Garriguet (2004) reported children's diets were less closely tied to household income. For instance they found there were no significant differences by household income in the proportion of young people who had fewer than five servings of vegetables and fruit each day, nor did the consumption of milk products appear to suffer. They also explained children living in low-income families were less likely to have visited a fast food restaurant in the day prior to the study collection. Although, others have argued household food insecurity was associated with suboptimal health status in 2-5 year olds in Vancouver. This study revealed, after controlling for household income, families with less access to food, fewer kitchen appliances and a lower rating on cooking skills were more likely to experience household food insecurity (Broughton, et al, 2006).

Canadian statistics suggest 10% of Canadian families live in food insecure households. Canadians are more likely to be food insecure if they live in low-income households, are dependant on social assistance, are lone-parents especially women headed homes, tenants, children and of Aboriginal ancestry (Che & Chen, 2001). Low income children have often been regarded as at-risk for under-nutrition, however, the prevalence of overweight in this group has recently increased (Jain et al, 2001). These children are also noted to be at risk for obesity later in life because their mothers are more likely to be obese. In fact, the presence of family food insufficiency at some point during the preschool years more than tripled the odds for obesity and doubled the odds of being overweight at 4.5 years. Children born at a low-birth-weight who experienced food insufficiency were more likely to be at a higher risk of overweight at 4.5 years (Dubois et al, 2006).

It has been demonstrated that low-income lone mothers compromise their own diet in order to preserve the adequacy of their children's diet. Mother's tended to eat better at the beginning of the month and their dietary adequacy declined as the month progressed (Glanville & McIntyre, 2006, & McIntyre et al, 2003). Nutrient inadequacy then declines for adults with noted concerns around nutrients such as protein, vitamin A, thiamin, riboflavin, vitamin B6, folate, vitamin B12, magnesium, phosphorus and zinc (Kirkpatrick and Tarasuk, 2008). This may be a concern for women who become pregnant leaving their growing baby with nutrient deficits even before birth. A study comparing children living in families with lone mothers versus those in two parent households, found those in lone mother households tended not to have the kinds of food they wanted to eat as well as not enough food to eat. However these same children in lone mother headed households consumed more energy despite spending less money on food, including less trips to fast food outlets. In this study US children in female headed households ate more high fat foods such as whole milk, frankfurters, and sausages. At the same time these families ate less of the more expensive fruits like melons and berries, and drank more non-diet carbonated beverages and sweetened fruit drinks (Bowman & Harris, 2003).

Summary – It is apparent eating behaviour is impacted by a child's environment. Parents and peers have been noted to play a key role in influencing child food choices. Parents face many challenges including time, and balancing healthy eating with structured sport activities. To facilitate healthy choices parents use bribery, nutrition education, boundaries, and creative solutions. Parent nutrition knowledge has been linked to increased availability of healthy foods. Parenting style, both permissive and restrictive has been linked to over and under-eating. Suggesting that a more participative or democratic styles may lead to healthier eating habits.

Food insecurity has the potential to impact child nutrition. However, research suggests mother's compromise their own diets before their child's so they are less likely to suffer from nutrient inadequacy. Children are more likely to be food insecure if they live in low-income female headed households, are dependant on social assistance or of Aboriginal

ancestry. Children in food insecure households are more likely to eat high fat foods such as whole milk and frankfurters, which may impact their levels of overweight.

4. Physical Activity and Sedentary Behaviour

Increasingly, leisure time activities for both adults and children are more sedentary, with a rise in screen time from television, video games and personal computing. As well, in industrialized countries like Canada many people find themselves expending less energy in standard activities of daily living. Frequently, studies are suggesting active lifestyles are important for children in order to optimize growth and development (Anderson, et al, 1998). Other researchers suggest physical activity is required to promote healthy physical, cognitive, emotional, and social development during the early years (Timmons et al, 2007).

“It has long been believed that play has both immediate and long term functional benefits for the child (Pellegrini and Smith 1998; Piaget 1952). The suggested mechanisms through which play contributes include: the formation of neural structures necessary for future activities (synapses and connections); practice of skills such as language, motor, and social-negotiation skills (mental and emotional mastery, cooperation, problem solving, and leadership skills); and serving as an important medium for childhood expression of emotion (Eaton et al. 2001). Physically active play matters psychologically and socially (Garcia and Garcia 2002; Pellegrini and Smith 1998).”

Timmons, et al, 2007

How much activity is enough for preschoolers? Presently national guidelines from the Canada’s Physical Activity Guide for Children recommends 60 minutes of moderate activity and 30 minutes of vigorous for a total of 90 minutes, but this is for children six and up (Public Health Agency of Canada, 2002). The American National Association for Sport and Physical Education (2002) were one of the first to outline guidelines for children younger than five. They suggest:

- Preschoolers should accumulate at least 60 min daily of structured physical activity,
- Preschoolers should engage in at least 60 min and up to several hours of daily, unstructured physical activity and should not be sedentary for more than 60 min at a time except when sleeping,
- Preschoolers should develop competence in movement skills that are building blocks for more complex movement tasks,
- Preschoolers should have no more than one hour of sedentary behaviour at a time
- Preschoolers should have indoor and outdoor areas that meet or exceed recommended safety standards for performing large muscle activities,
- Individuals responsible for the well-being of preschoolers should be aware of the importance of physical activity and facilitate the child’s movement skills.

Although measuring physical activity in childhood is difficult due to its sporadic and spontaneous nature, recent numbers in the US suggest children aged 4-11 years 37% had low levels of physical activity or less than 6 play times in a week (Anderson et al, 2008). Although no national statistics exist for physical activity levels of Canadian preschoolers, data from Alberta parents reported that 42% of their children were getting

at least 90 minutes a day (SHAPE-Preschool, Spence,). Measured and self-reported data revealed children that were more active were likely to be boys, younger, live in household with a higher income, and have no physical disabilities (Active Healthy Kids Canada, 2009). Other studies of objectively measured physical activity and sedentary behaviour in preschoolers show physical activity levels are typically low and sedentary behaviour is high (Reilly, 2008). A study of parents of preschoolers in London, Ontario found nearly half of the study's parents reported their preschoolers did not engage in enough activity for health gains (Tucker, & Irwin, 2009).

With this increase in sedentary behaviour there is less time for children to be physically active, and it has been suggested this decline in activity may promote overweight in children. Preschoolers screen time has been reported at between 1 and 4 hours a day (Tucker & Irwin, 2009). Increased TV time has also been linked to increased rates of hypertension in children 4-17 years of age (Pardee, et al, 2007). For those children who watched 2-4 hours of TV daily they had a 2.5 times the odds of hypertension compared to those who watched less than 2 hours. A review of evidence by Reilly (2008) supported the hypothesis that physical activity is protective of obesity in preschoolers, and that sedentary behaviour, particularly television viewing is obesogenic. Crespo and colleagues research showed for children 8-16 years in the US, increased hours of television viewing was associated with a higher prevalence of obesity among girls. As well, they found children who watched the greatest number of hours of television a day had the highest prevalence of obesity. Total energy intake was associated positively with hours of television viewing especially among girls ($R=0.43$) versus boys ($R=0.26$) (Crespo et al, 2001). This was further supported by researchers (Jackson et al, 2009) who found that for every extra hour of television watched there was an association of an extra 1 kg of body fat. Janz and colleagues (2002) found children in the lowest quartile for vigorous activity had higher body fat percentages than those children who were most active. Body fat percentages for children in the highest category for television watching were 3% higher than for those watching the least amount of television (Janz, 2002). Others point out that the relationships between sedentary behaviour and health are unlikely to be explained using single markers of inactivity such as TV viewing or video/computer game use (Marshall, et al, 2004). A higher percentage of children in female-headed households watched more than 2 hours of television a day (Bowman & Harris, 2003).

Research has supported the notion children who spend more time in front of TV have adverse dietary practices. Children who spent more time TV viewing were found to have higher intakes of sugar-sweetened beverages, fast food, red and processed meat, higher energy intakes as well as an increase in trans fat consumption. For children who watched more television, researchers found (Miller et al, 2008) these same 3 year olds had lower intakes of fruits and vegetables, lower dietary fiber and calcium intakes. Some of these poor food consumption patterns have been linked to television advertising. Carter (2006) pointed out energy dense food advertising is ubiquitous with children's television programming. Though there is little evidence to directly link food advertising to childhood obesity, comprehensive approaches considering this issue is important.

Dubois and colleagues (2008) found $\frac{1}{4}$ of children ate at least twice daily in front of the television. Preschool children who consumed snacks while watching TV had a higher BMI than children who did so less frequently. Frequent TV watchers ate more carbohydrates, more fat and less protein, fewer fruits and vegetables, and drank soft drinks more often than children who never ate snacks in front of the TV (Dubois, et al, 2008). Increased TV viewing was associated with increased energy intake, increased

sweet snack and high-energy drink consumption and decreased vegetable intake in a group of 560 preschoolers (Campbell, et al, 2006).

A question was posed by New Zealand researchers as to whether patterns of activity change over time in preschoolers. This research found 3- 5 year olds spent approximately 90 minutes a day with screen time, with an additional 90 minutes in other sedentary behaviours such as reading, and drawing. They also noted physical activity was significantly reduced at 4 and 5 years compared with 3 years in both sexes (Taylor et al, 2009).

The opportunity for children to be physically active has been shown to be dependant on proximity to facilities for participation in activities, finances to afford activities, opportunities to safely engage in sports, outdoor play and exercise (Gable, et al, 2007; Veugelers, 2008; Crespo et al, 2001). Learning to be physically active as a young child may be a more potent motivator for physical activity in later life, than the knowledge of why being active is important (Anderson et al, 1998). Strategies that aim to prevent childhood obesity through the promotion of healthy eating, physical activity and reductions in sedentary behaviours have shown various levels of effectiveness (see systematic review of literature by Campbell & Hesketh, 2007 for more details). Parents were both receptive to such strategies and were found to be capable of changes that promote healthier weights for their children (Campbell & Hesketh, 2007, Tucker et al, 2006).

Summary – Children are spending more time in sedentary activities including time in front of screens. Optimizing growth and development requires a certain level of activity for preschoolers between 90 and 120 minutes a day are recommended. One Canadian study showed only 42% of children were getting the 90 minutes a day recommended. The more active children were likely to be boys, younger, and live in higher income households. Physical activity tends to decline at ages 4-5. Children require access to facilities and neighbourhoods that promote outdoor play and exercise. Increased sedentary behaviour, notably screen time, has been associated with increased prevalence of obesity. Some of this increase might be explained by increased calorie consumption from low nutrient high calorie foods, and lower intakes of vegetables and fruit.

Methods

The tool was included in JK booklets provided by Fair Start in partnership with the school boards in Thunder Bay and Greenstone regions in winter 2009 (see below for more information). Public Health Nurses in other district offices were trained to deliver the tool at local JK screening events. All screeners/facilitators were instructed to send the tools back to the health unit office for inputting by the Public Health Dietitian. Dietetic interns and a summer nutrition student assisted with the data entry.

A database developed by researchers at the University of Guelph was adapted to collect the data from NutriSTEP[®] in our district. The database was constructed in MicroSoft Excel. The data was then transferred to SPSS 16.0, where descriptive statistics including frequencies and cross-tabulations and correlations were calculated (See Appendix 7). Assistance on the use of SPSS was provided by our health unit epidemiologist, a statistics professor from Lakehead University and a research methods professor.

Comparisons were made between overall risk levels found in the local data collected during the 2008 targeted implementation study conducted by University of Guelph with this year's 2009 implementation. The final report was reviewed by members of the Fair Start and Healthy Weights team as well as some members of the NutriSTEP[®] Provincial Advisory Committee.

The review of literature included searching for relevant English language publications in PubMed, Academic Search Primer, CINAHL, Medline, Nursing and Allied Health, Psychology and Behavioural Sciences and the Cochrane Database. The search terms used included "physical activity" or "motor activity" or "physical fitness", "diet" or "nutrition" or "exercise", or "physical inactivity", "nutritional assessment" or "food habits" or "nutritional status" or "healthy weight", "obesity", "body weight", "growth and development", "television", "feeding methods", "television viewing" and this was then limited to preschoolers and Canada.

Implementation of NutriSTEP[®] in Thunder Bay

FAIR START is a local program that screens children 18 months to school age, with the goal of promoting healthy child development and early identification of developmental concerns. FAIR START screens for speech and language development, motor skills, social development and now nutrition and physical activity habits. Fair Start screening is available as an early years screen (18 months to 4 years), and as a Junior Kindergarten (JK) screen (3 and 4 year olds starting school). Early Years screening is offered on a regular basis in various locations in the community. JK Screening is done by means of a JK Screening Booklet which parents are given when their child registers for school. In 2009, the NutriSTEP[®] tool was added to the JK Screening Booklets produced and distributed by the Fair Start program. This means that every parent/guardian of a child who registered for JK in the Thunder Bay District received it.

NutriSTEP[®] was implemented using an assisted referral model in Thunder Bay through community sites where Fair Start had regular scheduled screenings. The introduction of NutriSTEP[®] started in Thunder Bay in 2008 as a part of the implementation research being conducted at the University of Guelph. The Site Coordinator who was a public health dietitian met with the Fair Start program to determine the process for integrating NutriSTEP[®] into Fair Start. Fair Start screening forms (see appendix) were adapted to include NutriSTEP[®] and referral maps for Fair Start screening were updated to address the risk levels in NutriSTEP[®]. The Site Coordinator collaborated with many of the stakeholders involved with Fair Start, including the Executive, Screening, and Communications Committees. This facilitated getting the word out about the program and also getting buy in and suggestions on how best to implement the project.

In Thunder Bay, when planning for the NutriSTEP[®] implementation study with the University of Guelph and while developing the referral map, local dietitians were contacted to discuss their potential role. One of the dietitians spoke with a group of pediatricians about the NutriSTEP[®] tool and they felt that it would be appropriate in a high risk scenario for a child to be referred to a physician before a dietitian. The information about the NutriSTEP[®] screening questionnaire was shared at health unit team meetings with HBHC nurses and the Family Health Team. An information letter was sent to the family physicians in the fall package that is sent out from the Family Health Team.

Subsequently, Fair Start screeners were trained by the Site Coordinator to use the NutriSTEP® tool. Three key training dates were arranged: two in September 2008 for experienced Fair Start screeners and one in January 2009 for the newly recruited screeners. This was done by using a power point presentation that had been developed by the Project Coordinator. Retired Teacher Volunteers were trained later on in the year in order to implement the tool with the JK screening booklets. In 2009, when full implementation began training dates were arranged for screeners in our district offices as well as teacher facilitators from all school boards. Training consisted of an the importance and need for nutrition screening, an overview of the tool, the referral map and the implementation study in general (in the first year) and how to share results with parents.

The NutriSTEP® questionnaire was completed and scored independently by the parents of children 3-5 years of age. The facilitator then checked the NutriSTEP® score and discussed the results with parents, including appropriate follow-up/referrals, based on the outcome. Referrals from NutriSTEP® were forwarded to the appropriate service providers along with a copy of the completed NutriSTEP® questionnaire (see appendices for referral map and tool). A demographic questionnaire and informed consent were also completed during the targeted implementation only in 2008. Parents were given Eat Right Be Active and How to Build a Healthy Preschooler educational booklets and an EatRight Ontario fridge magnet as incentives for participation and as a reference on healthy eating and active living ideas.

Challenges to the NutriSTEP® screening process in Thunder Bay were as follows:

- The Site Coordinator was unable to provide the preschool “Nutrition 101” training to screeners due to time restraints.
- The length of time to complete the tool due to the extra pieces needed for the study (demographics, consent form and folding) was a limitation as parents had other paperwork to fill out as they attended the screening.
- The NutriSTEP® tool was added to the Fair Start screening sites in the same year as fluoride varnish which added to the workload of the facilitator and screeners.
- There was an increase in workload throughout the study period for the Fair Start Facilitator and for program support staff (copying, taking appointments for newly scheduled fair dates).

The Fair Start program in general had focused their promotions on encouraging parents to bring children for screening early, around 18 months. Therefore, recruitment of 3-5 year olds at community screenings was more difficult. Although, some screeners at daycares were interested in participating in the implementation study, this was not feasible for the targeted implementation study in 2008 but was implemented at these sites in 2009.

Results from the Implementation Study

At the Thunder Bay sites, tracking sheets on time taken for the various stages of the NutriSTEP® screening process were completed by the facilitators. Mean time (\pm SD) (for both sites combined) taken to explain the study and consent form was 2 ± 1 minutes; time taken for parents to complete the NutriSTEP® and demographic questionnaires was 11 ± 4 minutes; and, time taken to explain the results and referral was 3 ± 2 minutes. Four percent of NutriSTEP® scores calculated by parents were different than the NutriSTEP® scores calculated by the facilitators in 2008. In 2009, 9% of parents

incorrectly calculated the scores, with 69% of them scoring the tool lower than it actually was and 31% scoring it too high.

The Thunder Bay assisted referral model was considered successful at the community level and the NutriSTEP® questionnaire was expanded across the district via the JK Screening booklet put out by the *Fair Start* Program in 2009. The NutriSTEP® questionnaire and education booklet, *How to Build a Healthy Preschooler*, went to every child in the city and district when the child registers for JK this past year (approximately 1100 preschoolers). Along with the JK process, the NutriSTEP® nutrition risk screening program is being implemented in the Healthy Babies Healthy Children (HBHC) program by public health nurses and family home visitors.

The health unit has created a database which was adapted from the University of Guelph implementation study to track child's eating and activity habits based on parent completed questionnaires.

The 2008 targeted implementation study noted that, 89.9% of parents felt the nutrition screening was useful. Many parents read the resources (53%) and felt they had enough support (83%) (Witchell, & Randal- Simpson, 2009). Parents felt screening was beneficial, because it made them think about their child's diet, it increased nutrition awareness, confirmed whether their child was doing well and pointed out potential areas for improvement (Witchell, E. & Randall-Simpson, J., 2009).

Follow up phone calls to the implementation study parents revealed that in Thunder Bay, seven parents were referred to their family physicians because of a high risk score; in addition, one parent whose child was moderate risk requested a referral. Further research from the University of Guelph determined that only three of the seven followed through with the referral.

Data Collection and Response Rate

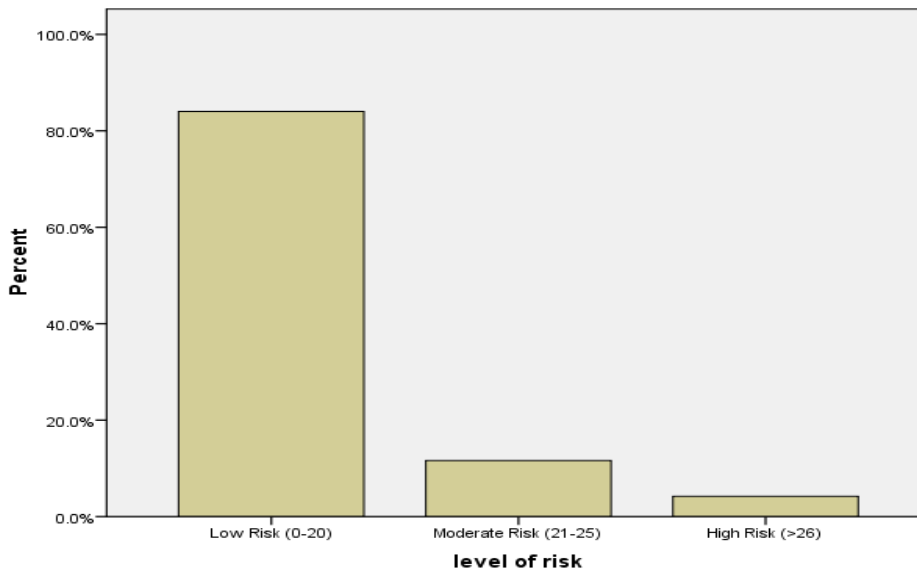
NutriSTEP® tools were added to the JK screening booklets, or distributed by Public Health Nurses in our branch offices for distribution to parents entering their child in JK in 2009. Approximately 1100 children enter junior kindergarten in our district each year and this is the number of tools that were distributed. Six hundred and sixty four tools were completed and returned to the dietitian at the health unit. This represents a response rate of approximately 60%. Since, not every parent however registers their child for kindergarten prior to September some families may not yet have received the tool and more are expected to be returned after the completion of this report.

Findings

The sample size used in the analysis was 664. Respondents were asked to provide demographic data including child age, sex, postal code and screen location and date. There was a fairly even split in the sex of the children with 355 (53.5%) boys and 290 (43.7%) girls, 19 questions had no response. The majority of children were three (53.2%) and four years old (41.4%), with a small number (1.4%) being five. Twenty six of the surveys did not have ages listed. The vast majority of children scored low risk (84%), 11.6% were at moderate nutritional risk, and 4.2% scored high (see Figure 1.0 – scores for risk level, were those recalculated by the site coordinator). Level of risk did

not appear to be associated with either gender ($p=0.140$) or age ($p=.078$). However, 18 male children were at high risk, and only 7 female preschoolers had high risk scores (>26). Four year old children ($n=18$) were more likely to have a risk score greater than 26, compared with their 3 year old counterparts ($n=8$, $p=.078$)

Figure 1.0 – Percentage of children who scored low, moderate and high risk on the NutriSTEP[®] tool in Thunder Bay District in 2009 ($n=664$, mean = 15, SD = 5.57, median = 14, Range of scores = 2 - 35)



When adding up the score on their own, parents calculated the score incorrectly in 9% of the cases ($n=59$). In the majority of cases (69%) parents underestimated the scores with 31% overestimating the score. This highlights the need to reinforce to facilitators to re-score the tool before following through with the referral process. In a couple of circumstances the NutriSTEP[®] coordinator found upon recalculation that children were actually at high and not moderate risk and thus required a referral.

Section 1: Physical Growth

The majority of parents (98.3%) are comfortable with the way their child is growing leaving a small percentage (1.7%) of parents who are concerned. Similarly, 94.9% of parents think their child is at an appropriate weight. An equal number of parents ($n=16$, 2.4%) were concerned and felt their child either needed to gain weight or lose weight.

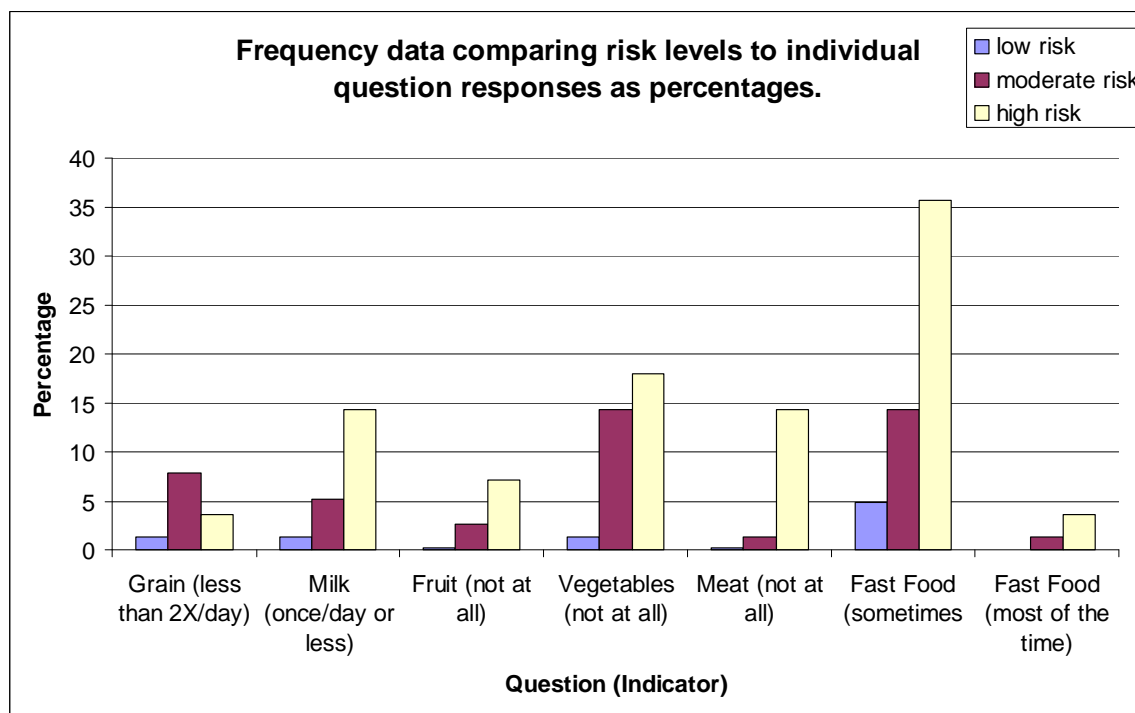
When calculating cross tabulations, no significant correlation was found between growth and either physical activity ($p=.041$) or sedentary behaviour ($p=.0698$). As we might expect, parents who were okay with the way their child was growing also felt that their weight was appropriate ($p=.000$). Parents who felt their child was at an appropriate weight also felt that their child was getting enough physical activity ($p=.003$). If a parent felt their child was not at a healthy weight they were more likely to feel their child needed more physical activity ($p=.003$).

Section 2: Food and Nutrient Intake

A number of questions in the tool focus on a child's intake based on the food groups outlined in Canada's Food Guide to Healthy Eating (Health Canada, 2007). Not surprisingly, children were likely to eat grain and milk products more than twice a day 97% of the time. Fruit intake was notably good with 88.9% of children having fruit at least twice a day. When reviewing the results of the meat and alternatives food group children had these foods at least two times a day, 71% of the time. Vegetable intake was the poorest with only 66.7% of children having vegetables at least two times a day.

Parents were asked how often their child had "fast food". Results revealed that 21% or approximately one in five children have fast food at least once a week, with 42% of preschoolers having fast food a few times in a month. When it comes to the pattern of preschooler eating, most eat 3-5 times a day (86.9%) and some (11.9%) eat more than 5 times a day. A small number (n=7, 1%) reported eating only twice a day. Although 37.7% (11.7%) of parents reported their child never or rarely takes a vitamin supplement more than 50% reported that their children had supplements at least sometimes.

Figure 2.0 – Frequency data comparing risk levels from the NutriSTEP® screening tool to the food and nutrient intake questions.



Using descriptive information calculated from a one-way ANOVA a multiple comparison (see Appendix 5 & 6) was calculated to see if any one questions response may have had a significant impact on the overall score and consequently the level of risk. There appeared to be a significant relationship ($p=.000$) in eight of the questions (Question 5, 7,9,10, 11, 14, 16, and 17).

The data file was then split based on risk level for the above questions to compare parent responses for each question. Interestingly results showed that children in the high risk category were more likely to eat less meat, fruit, milk, and vegetables but not

grain products than those who were rated as low risk. When it came to fast food consumption 15.6% of children in the moderate risk category were having it sometimes or most of the time, compared to the high risk group with 39.1%.

Section 3: Factors affecting intake and eating behaviour

Food insecurity, or worrying about having enough money to buy food was a concern most of the time for 2 respondents (0.3%), but 48 (7.2%) felt that sometimes it was difficult for them to buy food to feed their child because food is expensive. While 92.5% of parents did not express concern about financial barriers to feeding their children it is essential that we consider the 7.2% of children who may be at risk for poor nutrition due to financial circumstances.

When looking at whether difficulty buying food had an impact on children’s consumption of foods from the food groups there were no statistically significant differences in, vegetable, milk or meat consumption for families who had difficulty buying food. However, fruit intake seemed to be impacted at p=.05 level.

Table 1.0 - Cross tabulations between food group intake and relationships to families who have difficulties buying food.

Food Group	Chi Square	Df	Significance p value
Fruit	26.325	12	.01
Vegetables	8.742	9	.461
Milk	10.390	9	.320
Meat	5.445	11	.941

When asked about how often children are allowed to decide how much to eat, parents let their children decide always 22.5%, most of the time 42%, sometimes 27.9%, rarely 5.7% and never only 1.4% of the time. Children were reportedly not hungry because they drink all day sometimes in 18.4% of the cases. The majority of parents suggested that it is uncommon for their children not hungry because they drink too much.

Figure 3.0 Parents responses to the question “How often do you let your child control how much they eat?” from the NutriSTEP® tool

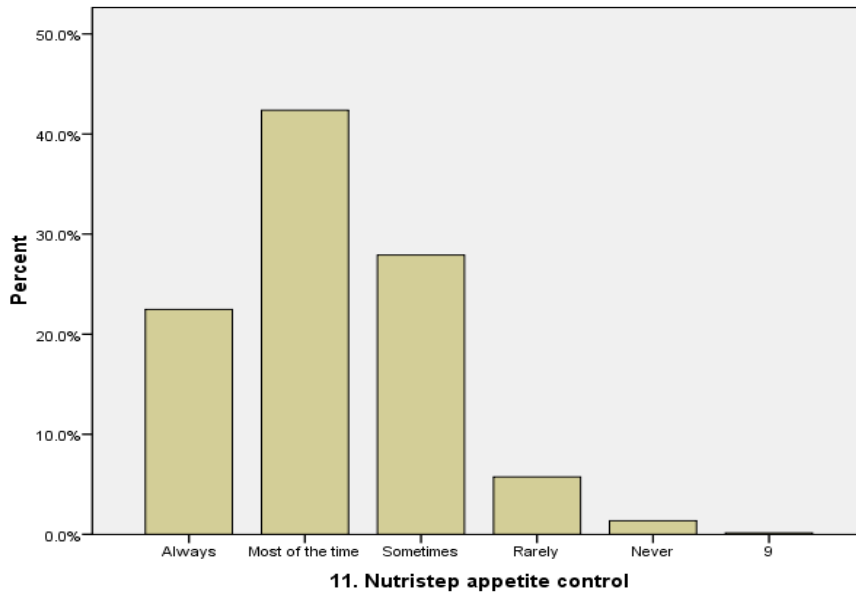
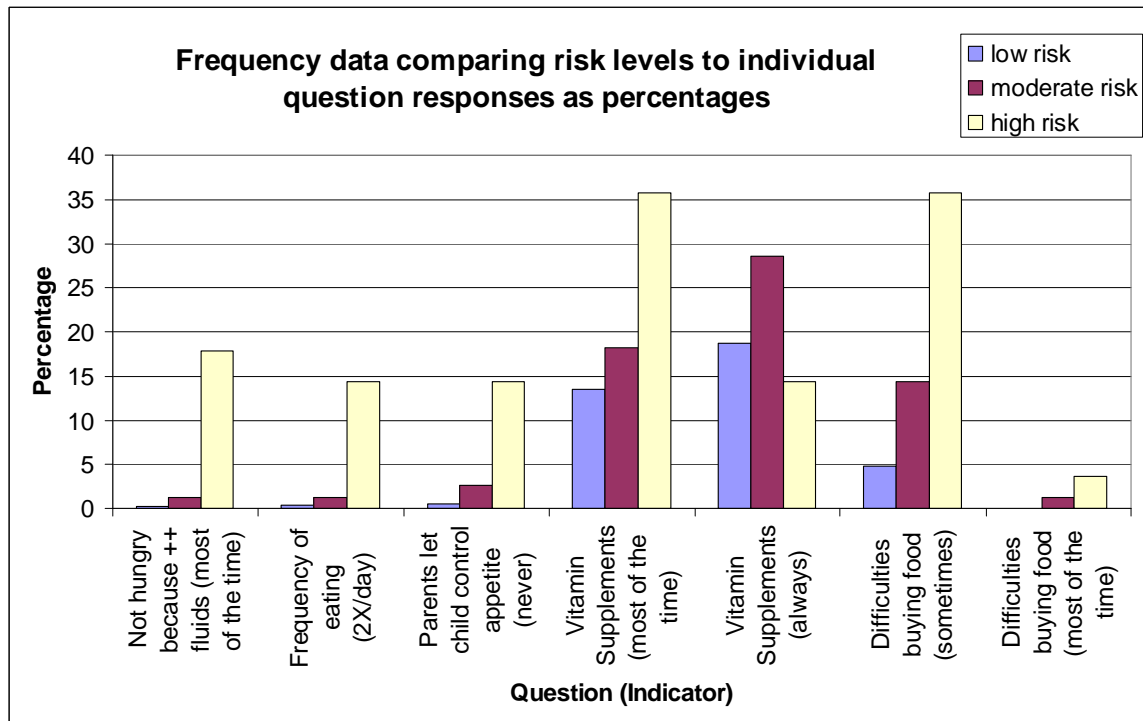


Figure 4.0 – Frequency data comparing risk levels to individual question responses related to factors affecting food intake.



Parents told us that 41% of preschoolers do eat in front of the TV sometimes, although 7.4% eat in front of the TV most of the time. There was not a significant relationship between appetite control and television watching ($p=0.413$). Those in the high risk

category were more likely to eat less than two times a day, and drink fluids throughout the day and not eat a sufficient amount at meal time. Parents let children control their eating less in the high risk category with 14.3% of children never able to control their own eating. Difficulty buying food due to its cost seems to have a direct link to risk level. Parents of children in the high risk category were more likely to have concerns around being able to purchase food due to its cost.

Section 4: Developmental and Physical Capabilities

The results from this survey show that few parents are concerned about problems with chewing, swallowing, gagging or choking when their children are eating. 85.4% never have concerns, 12% rarely have concerns and only 2.4% sometimes are concerned with their child’s physical capabilities around eating.

Section 5: Physical Activity

Most of the parents (90.1%) in our sample think their preschooler is getting enough physical activity. However, a third (33.5%) of our preschoolers had more screen time (3 or more hours a day) than is recommended. Note that more than 40% are spending at least two hours a day in front of screens. As expected, we found a statistically significant relationship between a decrease in physical activity and an increase in sedentary behaviour ($X^2 = 21.791, df=4, p=.000$). Another interesting association that was found noted that fruit intake was lower in those who were less physically active ($X^2 = 20.947, df=4, p=.000$). Though there was not a statistically significant difference for vegetables the p value was .007. There was not a strong correlation between fast food and sedentary activity ($r=.107, p=.006$) but it is worth considering.

Figure 5.0 - Showing number of hours preschoolers spent in front of screens in our sample (n=664)

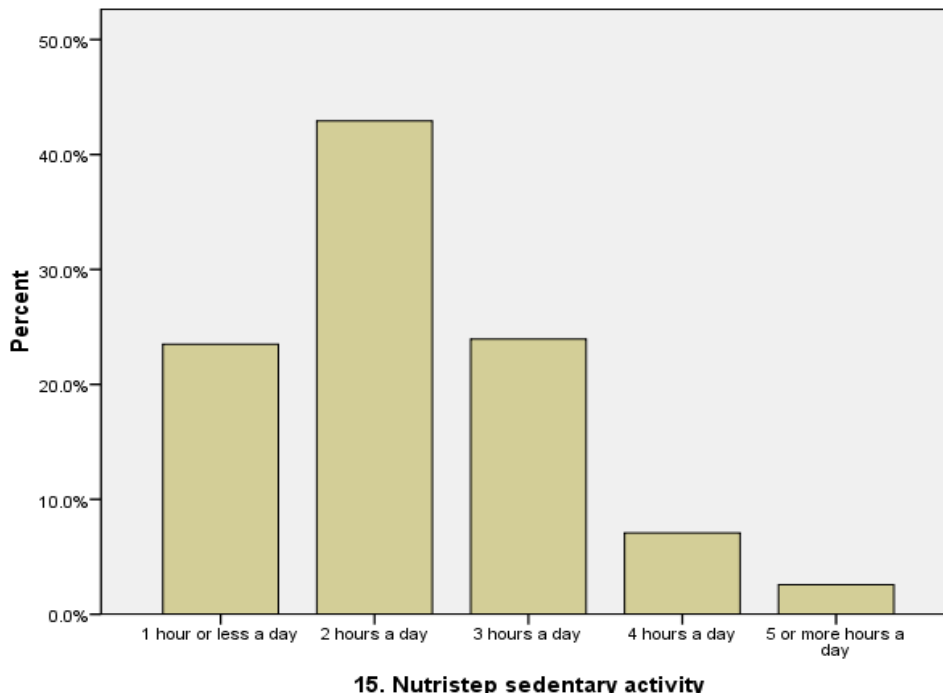
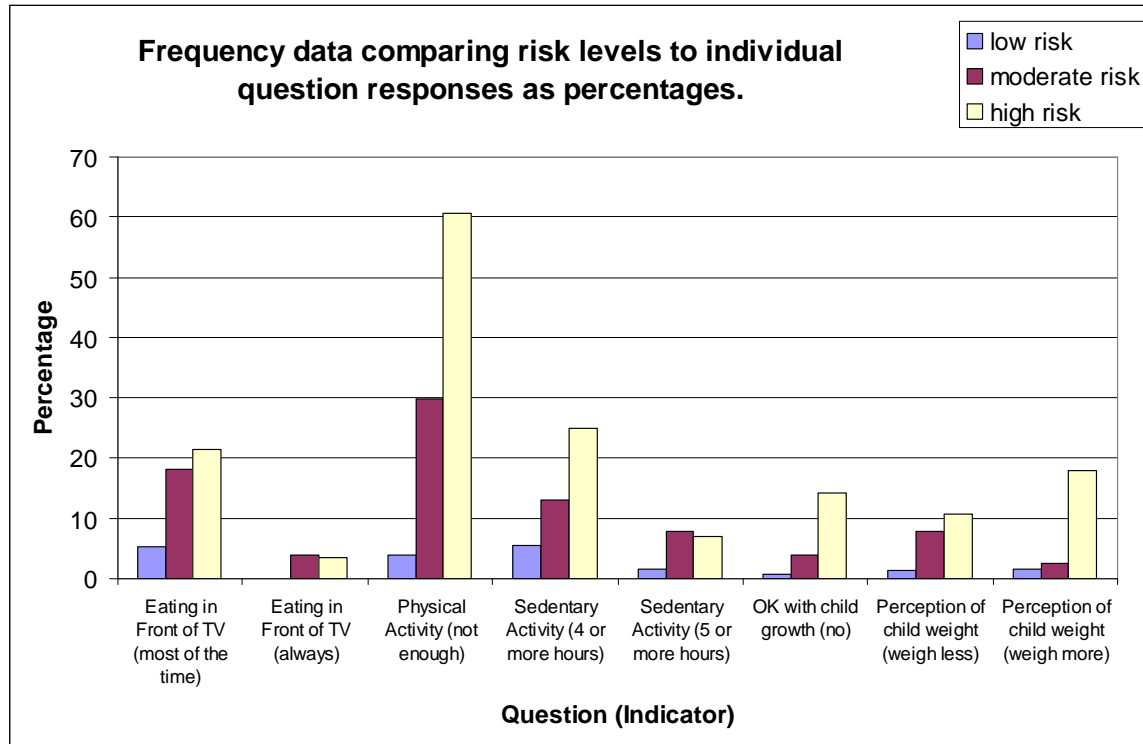


Figure 6.0 – Frequency data comparing risk levels to questions related to physical activity, sedentary behaviour and growth responses.



Eating meals in front of the television was reportedly higher in the high risk category with 21.4% most of the time, and 3.6% always eating in front of the television. When it came to physical activity 60.7% of parents of high risk children felt they were not getting enough activity compared to 3.9% for low and 29.9% for moderate risk preschoolers. Parents were more likely to be concerned that a child was not growing well if they were rated as high risk with 14.3% of parents concerned. Parents of children in the high risk category were more likely to feel that their child needed to weigh more or less.

Limitations

Demographic information was not collected in this study and so we were unable to make inferences such as one or two parent households, parent who completed the tool, income, etc. The date of screen completion was missing for many of the tools, therefore we cannot investigate potential climate related concerns may have led to children's activity and sedentary patterns. Winter for instance in Thunder Bay can be very cold, eliminating the possibility of outside play for many days, which may lead to more TV viewing.

Another potential limitation to the study is around parental interpretation of the questions. Since parents filled out the tool notably on their own they may have interpreted things like "fast food" and "control of eating" differently. The use of terms like sometimes, always and never may have different meaning to individuals as well, and may impact parent responses though the validation research suggested that parents scores reflected dietitian assessments. Increased time and expertise in analysis would yield a more in-depth study. Future studies might look at adding in demographic information, looking at gender differences, analysis of postal code influences, follow up phone calls with parents to find out how they felt about the tool, and if they made any changes to their child's eating and activity habits based on the resources provided. The tool itself does not target questions around parenting style and feeding children has been noted to be

directly related to this element. Future inquiries might look at this area to provide insight to program planning to address this issue.

Discussion

Implementation of the NutriSTEP[®] tool in the district of Thunder Bay has been a relatively simple process due to its pairing with the established Fair Start program and specifically the JK booklet and school registration in 2009. Earlier reports suggest parents found the screening process and the educational resources to be useful when asked in a telephone interview conducted by a University of Guelph student, (Witchell, 2009). Parents thought that nutrition screening was helpful (89%) and 83% read the resources and felt they had enough support. Parents thought that completing the tool made them think about their child’s diet and reinforced what they were already doing. The assisted referral model worked well, but improvements could be made as only 3 out of 7 parents who were referred to a health professional followed up in the 2008 targeted implementation study. Another concern is regarding parental scoring which was incorrect 9% of the time in our recent 2009 data. In future training sessions, screeners will need to be reminded to recalculate the score to ensure that a child is placed in the correct risk level.

Risk levels in our study when compared with the validation research and the implementation study are below in Table 5.0. The levels of high risk across the three studies were similar. In the Thunder Bay district there seemed to be a significant difference in the level of moderate risk scores when compared with the provincial validation research. In our sample the majority of parents ranked their child as low risk. Despite the smaller sample (n= 152) size in the original targeted implementation research conducted in 2008, risk level results were very similar to the risk levels of the tools collected in 2009.

Table 5.0 Risk Levels from the validation research for the NutriSTEP[®] tool compared to the results from implementation in Thunder Bay in 2008 and 2009.

Risk Level	Validation Research (Randall-Simpson et al, 2008)	Implementation Study Thunder Bay -2008 (n=152)	Full Implementation Thunder Bay 2009 (n=664)
Low	62.8%	86%	83.9%
Moderate	32.3%	9.2%	11.6%
High	4.8%	4.6%	4.2%

Eating Habits and Factors Affecting Them

Overall intake from the various food groups appeared to be good with children eating the recommended servings from grain products, fruit and dairy most of the time. However, when it came to meat and alternatives only 71% of children ate these at least two times a day. A similar concern existed around vegetable intake where only 67% of children had vegetables at least twice a day. This means that a third of children are likely not getting the number of vegetables needed for good health. Copious amounts of literature point to the importance of vegetables and fruit for decreasing rates of chronic diseases such as heart disease, diabetes and cancer (Riboli et al, 2003; Dauchet et al, 2006, Van Horn et al, 2008), while other information points to more immediate impacts of vegetable

and fruit consumption in decreasing the rates of illness (Jones & Smith, 2006). Children who are not eating foods from the meat and alternatives food group are at increased risk for iron and zinc deficiency and the potential development consequences.

Eating frequency seemed appropriate with 99% of children eating at least 3 times a day and only 1% eating less than twice a day. One in five preschoolers were eating fast food at least once a week with 42% eating fast food a few times a month. Excess consumption of fast food may mean children are eating too much saturated fat, sodium and not enough fibre. In the literature review we discussed the balancing act that some parents play when trying to get children to eat and get them to sporting events (Tucker et al, 2006). Program development and social marketing messages should focus on helping parents ensure their children are both well fed and active.

Fifty percent of preschoolers were taking a multivitamin always, most of the time or sometimes. There is a concern that parents are giving these to children because they feel they are not eating enough food with the nutrients they need, in a sense the vitamin supplements act as insurance. Dietitians recommend that children and adults get their nutrients from food, and research shows that by following the food guide we can achieve the recommended nutrient intakes (Rock, 2007). Twenty percent of the time preschoolers drank too much during the day to be hungry at mealtimes. A reduction in hunger for meals due to a high beverage intake may impact a child's intake from other food groups, therefore compromising their nutritional intake. Increased beverage consumption could also have an impact on child weight as studies have linked increased consumption of sugar sweetened beverages with overweight in children (O'Mara, L, 2008; Miller et al, 2008).

Almost half of preschool children in our district eat in front of the TV sometimes/most of the time (41%, 7.4% respectively). With data showing that eating in front of the TV may be linked to increased calorie consumption especially among girls (Crespo et al, 2001), increased intakes of sugar-sweetened beverages, fast food, red and processed meat and trans fats, and lower intakes of vegetables and fruit, as well as fiber and calcium (Miller et al, 2008) we have reason to be concerned. In particular, an increase in hypertension was noted in children who watched 2- 4 hours of TV daily. Television advertising of high calorie low nutrient foods may play a role in this but more evidence is needed.

When the data was separated by risk values and the questions were re-examined we found many significant differences in the eating habits of children in the high risk category. For instance, high risk children were less likely to eat meat, fruit, milk and vegetables but not grain products. They were more likely to eat less than twice a day, to eat fast food, to eat in front of the TV, have minimal control over their own eating, and to come to a meal not hungry due to higher beverage consumption throughout the day. Community education programming around child nutrition and obesity prevention could begin by targeting these issues.

Factors like food availability due to income levels may have an impact on what children are able to eat. Parents reported difficulty buying food sometimes due to the cost of food in 7.2% of the cases, with 0.3% of cases having trouble most of the time. This number increased for children in the high risk category where more than 35% of children may be at risk for food insecurity. This is a concern due to the increased risk of becoming overweight, suffering illnesses and the potential for learning deficits if children do not have enough to eat (Jain et al, 2001; Taras, H., 2005, p.208). This data did not

show that children's diets were compromised. A fact which is consistent with research that has found that parents compromise their diets before the child's diet becomes compromised (Glanville & McIntyre, 2006; McIntyre, 2003; Kirkpatrick & Tarasuk, 2008).

Children having control over what they eat is important to enable them to become aware of their natural hunger and satiety cues. Data suggests that children who live with either permissive parents or those who are restrictive in their feeding styles may be at risk (Taylor et al, 2005; Valente et al, 2007; Farrow et al, 2009). More democratic and participative approaches of parenting around feeding may be beneficial models to teach for healthy eating and promote healthy weights in children. In our study sample only 64% of children had control over their own eating always or most of the time. This leaves almost half (46%) of children having many of their food decisions outside of their own control. There is concern that children may develop a habit of overeating that could lead to overweight or other conditions that lead to malnutrition (Orrell-Valente et al, 2007). Encouraging children to eat "one more bite" or using bribery with unhealthy foods may lead to deregulation leaving a child unable to self-control hunger (Tucker et al, 2006).

Family based obesity prevention strategies that focus on the family feeding environment may be useful (Campbell, et al, 2006). Collaborative efforts with public health and social services should work to improve practical skills, access to healthy foods and increase household resources that allow for preparation of nutrient dense foods (Broughton, et al, 2006). Nutrition education for children (Taylor et al, 2005) and parents need to identify healthy choices and might begin by focusing on reducing sugar sweetened beverages and increasing lower fat meat and dairy products (Bowman, 2003) especially in low income single parent family households. Strategies to assist parents with problematic eating either picky or overeaters will be important to develop to shift negative eating patterns (Dubois, et al, 2007).

The overall feeding environment stretches beyond the household. Changes need to be made to improve the food availability at grocery stores, recreation facilities and within daycares where young children congregate. Greater perceived access to food stores meant that children had healthier diets and were less likely to be overweight (Veugelers, et al, 2008). Families who presently struggle to put healthy meals on the table and get a child to a physical activity program need help. Changing neighbourhoods so that parents are comfortable letting children be active outside, finding healthier fast food options and alterations in work schedules could facilitate improvements in preschooler diets and activity levels. Subsidies on healthier options including fruits and vegetables may assist families in ensuring nutritious meals and snacks could be provided.

Activity and Growth

Most parents of preschoolers (90%) feel their child is getting enough physical activity. However, a third of children were watching more than three hours of screen time daily. Recommendations from various agencies suggest that preschoolers get less than two hours a day, while some suggest no more than one hour of screen time (American National Association for Physical Education). A statistically significant association was found between physical activity and sedentary behavior, in that as one increased the other decreased. Particularly striking is that of parents of high risk children 60% of these parents said their child was not getting enough activity, and this was coupled with more than 30% of them getting four or more hours of screen time a day.

Parents seemed to have little concern about how their child was growing. Ninety eight percent felt their child was growing fine and an equal percentage of parents (2.4%) felt their child either needed to gain weight or lose weight. For the high and moderate risk children, parents were more concerned that their child should weigh less. The need for a child to weigh more was present more often in the high risk children.

Physical activity rates are partly dependant on the neighbourhood children lived in. There is a positive association noticed with good access to playgrounds, parks and recreational facilities (Veugelers, et al, 2008). This fact emphasizes the point that public health professionals should continue to advocate for policy and infrastructure changes that impact the way neighbourhoods are constructed and maintained over time.

Parents agreed that physical activity programming was an ideal way to combat obesity in preschoolers. Modifying current programs to include morning and afternoon sessions and arranging for physicians to handout resources with physical activity ideas particularly in winter months might be a strategy worth implementing (Tucker, et al, 2006). Daycare facilities are an important place to provide preschoolers with physical activity programming and embed activity into their daily life before school entry (Tucker & Irwin, 2009; Needham et al, 2007; Taylor et al, 2005; Birch & Ventura, 2009) Program planners and health professionals can help develop strategies to over-come challenges such as child-care staff practices that are inconsistent with health professional recommendations, provide education to parents to encourage their children to eat in a healthy way, and work with childcare agencies to ensure healthy foods are served (Needham, et al, 2007).

Conclusion

Preschooler nutritional risk in the district of Thunder Bay appears low based on these study results. Public health strategies could begin by addressing some of the key issues that were identified: children's vegetable consumption, fast food intake, television and screen time, and parental control of eating. We must also be mindful that adequate income is essential to ensure children and families have enough healthy food. This fact should be taken into consideration when planning programs and developing advocacy campaigns around healthy weights for children. Epidemiological findings point to even earlier modifiable risk factors, including gestational weight gain, maternal pre-pregnancy weight and formula feeding (Birch & Ventura, 2009) that could be addressed concurrently with the above concerns. Working through licensed daycare programs including home daycares might be an ideal starting point. Interventions including educational materials need to go beyond information dissemination and engage parents' emotions around food and feeding children. Potential value for interventions that focus on behavioural parenting techniques may be of benefit (Pagnini et al, 2007) and some suggest focusing on the following topics: less screen time (Bowman, 2003), eating breakfast (Dubois, 2006), eating away from the TV (Dubois, 2006 & Farmer et al, 2008), and family meals due to the protective role they play in obesity prevention (Gable, 2007). With some associations such as the Canadian Pediatric Society (CPS, 2002) asserting that 70% of obese children will grow up to become obese adults, and with the current high costs of obesity to our health and our health care system, it is essential to begin early to develop healthy eating and activity habits in young children.

Recommendations

Implementation of the NutriSTEP® Tool

1. Continue to implement NutriSTEP® along with the JK booklets distributed by the Fair Start program through the school boards in all of the district communities.
2. Provide updated training to screeners and emphasize the need to recalculate the scores.
3. Continue to collect data from the tool and input into the established database as well as monitor longitudinal trends
4. Consider approaching family physicians and nurse practitioners to implement the tool in their practices, perhaps begin by approaching family health teams in city and district.
5. Health organizations that provide care to families with preschoolers need to ensure that providers have the knowledge and skills to support parents to provide healthy eating and physical activity information
6. Research findings to be shared via a report with all programs related to preschool including the school board administration and (JK teachers), Best Start hubs, and public health nurses in city and district offices.

Eating Habits

1. Focus messaging to parents of preschoolers around strategies to increase meat and vegetable consumption, focus on getting nutrients from food versus supplements, to decrease fast food intake, eating in front of the television, and drinking caloric beverages between meals.
2. Work with parents to practice more participative parenting that involves children having control over what they eat – this could be done with other parenting programs being implemented in the community such as Triple P®.
3. Advocate for adequate incomes and food subsidies that allow families to purchase healthy food including vegetables and fruit (ie. Through support of the Good Food Box program).
4. Collaborative efforts between public health and other social service agencies to improve the food availability in daycares, schools, recreation facilities and grocery stores.
5. Implement nutrition education strategies that target both parents and children to prevent misinformation being passed on.

Activity Habits

1. Increase access to quality physical activity through preschool programs this might include training staff (at licensed daycares and Best Start Hubs) in the area of physical literacy.
2. Advocate for policy and infrastructure changes that impact the way neighbourhoods are constructed to support active transportation and safe outdoor play.
3. Target promotional campaigns on decreasing screen time to less than two hours a day for preschoolers – especially in winter months.

References

- Active Healthy Kids Canada. (2009). Canada's report card on physical activity for children and youth. Retrieved August 4th, from http://www.activehealthykids.ca/ecms.ashx/ReportCard2009/AHKC-Longform_WEB_FINAL.pdf
- Anderson, S.E, Economos, C.D. & Must, A. (2008). Active play and screen time in US children aged 4-11 years in relation to sociodemographic and weight status characteristics: a nationally representative cross-sectional analysis. *BMC Public Health*. 8: 366.
- Anderson, R.E., Crespo, C.J., & Bartlett, S.J. (1998). Relationship of Physical activity and television watching with body weight and level of fatness among children: Results from the Third National Health and Nutrition Examination Survey. *Journal of American Medical Association*. 279(12):938-942.
- Birch, L.L. & Ventura, A.K. (2009). Preventing childhood obesity: what works? *International Journal of Obesity*, Supp.1(33): S74-S81.
- Borzekowski, K.L. A& Robinson, T.N. (2001). The 30-Second effect: An experiment revealing the impact of television commercials on food preferences of preschoolers. *Journal of the American Dietetic Association*, 101, 42-46.
- Bowman, S.A. & Harris, E.W. (2003). Food security, dietary choices, and television-viewing status of preschool aged children living in single-parent or two-parent households. *Family Economics & Nutrition Reviews*. 15(2):29-34.
- Broughton, M.A., Janssen, P.S., Hertzman, C., Innis, S.M. & Frankish, C.J. (2006). Predictors and outcomes of household food insecurity among inner city families with preschool children in Vancouver. *Canadian Journal of Public Health*. 97(3):214-216.
- Campbell, K.J. & Hesketh, K.D. (2007). Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years: A systematic review of the literature. *Obesity Reviews*. 8(4):327-338.
- Campbell, K.J., Crawford, D.A. & Ball, K. (2006). Family food environment and dietary behaviours likely to promote fatness in 5-6 year-old children. *International Journal of Obesity*. 30(8):1272-1280.
- Canadian Pediatric Society. (2002). Healthy active living for children and youth. *Paediatric Child Health*, 7, 339-345.
- Carter, O.B. (2006). The weighty issue of Australian television food advertising and childhood obesity. *Health Promotion Journal of Australia*. 17(1): 5-11.
- Che, J. & Chen, J. (2001). Food insecurity in Canadian households. *Health Reports, Statistics Canada*. 12(4);11-22.
- Contento, I.R., Basch, C., Shea, S., Guting, B., Zybert, P., Michela, J.L., & Rips, J. (1993). Relationship of mothers' food choice criteria to food intake of preschool

- children: Identification of family sub-groups. *Health Education Quarterly*, 20: 243-259.
- Crespo, C.J., Smit, E., Troiano, R.P., Bartlett, S.J., Macera, C.A., & Anderson, R.E. (2001). Television watching, energy intake, and obesity in US children. *Archives of Pediatric and Adolescent Medicine*. 155:360-365.
- Dauchet, L., Amouyel, P., Herbeg, S., Dallongeville, J. (2006). Fruit and Vegetable Consumption and risk of Coronary Heart Disease: A meta-analysis of cohort studies. *Journal of Nutrition*; 136: 2588-2593.
- Dubois, L., Farmer, A.P., Girard, M. & Peterson, K. (2008). Social factors and television use during meals and snacks is associated with higher BMI among pre-school children. *Public Health Nutrition*. 11(12):1267-1279.
- Dubois, L., Farmer, A.P., Girard, M. & Peterson, K. (2007). Preschool children's eating behaviours are related to dietary adequacy and body weight. *European Journal of Clinical Nutrition*. 61(7):846-855.
- Dubois, L., Farmer, A., Girard, M. & Porcherie, M. (2006) Family food insufficiency is related to overweight among preschoolers. *Social Science Medicine*. 63(6): 1503-1516.
- Dubois, L., & Girard, M. (2006). Early determinants of overweight at 4.5 years in a population-based longitudinal study. *International Journal of Obesity*. 30(4):610-617.
- Duke, R.E., Bryson, S., Hammer, L.D. & Agras, W.S. (2004). The relationship between parental factors at infancy and parent-reported control over children's eating at age 7. *Appetite*, 43(3):247-252.
- Faith, M.S. & Kerns, J. (2005). Infant and child feeding practices and childhood overweight: the role of restriction. *Maternal & Child Nutrition*, 1(3): 164-168.
- Faith, M.S., Scanlon, K.S., Birch, L.L., Francis, L.A. & Sherry, B. (2004). Parent-child feeding strategies and their relationships to child eating and weight status. *Obesity Research*, 12(11):1711-1722.
- Faith, M.S., Heshka, S., Keller, K.L, Sherry, B, Matz, P.E., Pietrobelli, A. & Allison, D.B. (2003). Maternal-child feeding patterns and child body weight: findings from a population-based sample. *Archives of Pediatrics & Adolescent Medicine*, 157(9):926-932.
- Farrow, C.V., Galloway, A.T. & Fraser, K. (2009). Sibling eating behaviours and differential child feeding practices reported by parents. *Appetite*, 52(2):307-312.
- Gable, S., Change, Y. & Krull, J.L. (2007). Television watching and frequency of family meals are predictive of overweight onset and persistence in a national sample of school-aged children. *Journal of the American Dietetic Association*. 107(1):53-61.
- Garriguet, D. (2004). Overview of Canadian Eating Habits. Statistics Canada Research Paper, Catalogue no. 82-620-MIE- No. 2.
<http://www.statcan.ca/english/research/82-620-MIE/82-620-MIE2006002.htm>

- Glanville, N.T. & McIntyre, L. (2006). Diet quality of Atlantic families headed by single mothers. *Canadian Journal of Dietetic Practice and Research*. 67(1):28-35.
- Hamer, M., Stamatakis, E. & Mishra, G. (2009). Psychological distress, television viewing, and physical activity in children aged 4-12 years. *Pediatrics*. 123(5):1263-1268.
- He, M., & Sutton, J. (2004). Using routine growth monitoring data in tracking overweight prevalence in young children. *Canadian Journal of Public Health*, 95:419-423.
- Health Canada. (2007). Eating Well with Canada's Food Guide. <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php>. Retrieved July 17th, 2009.
- Hendy, H.M., & Raudenbush, B. (2000). Effectiveness of teacher modeling to encourage food acceptance in preschool children. *Appetite*, 34:61-76.
- Hennesey-Priest, K.A., Mustard, J.L, Keller, H.H, Rysdale, L.A., Beyers, J.E., Goy, R., and Randall Simpson, J. (2008). Zinc-Fortified Foods Do Not Improve Intake of Total Dietary Zinc for Ontario Preschoolers. *Journal of the American College of Nutrition*. 27(5): 561-568.
- Hennesey-Priest, K.A., Mustard, J.L, Keller, H.H, Rysdale, L.A., Beyers, J.E., Goy, R., and Randall Simpson, J. (2008). Folic acid food fortification prevents inadequate folate intake among preschoolers from Ontario. *Public Health Nutrition*
- Jackson, D.M., Djafarian, K., Stewart, J. & Speakman, J.R. (2009). Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. *American Journal of Clinical Nutrition*. 89(4): 1031-1036.
- Jain, A., Sherman, S.N., Chamberlain, D.L (2001). Why don't low-income mother's worry about their preschooler being overweight? *Pediatrics*, 107(5): 1138-46.
- Janz, K.F., Levy, S.M., Burns, T.L., Torner, J.C., Willing, M.C. & Warren, J.J. (2002). Fatness, physical activity, and television viewing in children during the adiposity rebound period: the Iowa Bone Development Study. *Preventive Medicine*. 35(6): 563-571.
- Jones, R. & Smith, F. (2006). Are there health benefits from improving basic nutrition in a remote Aboriginal community? *Australian family Physician*. 35(6): 453-454.
- Keller, K.L., Pietrobelli, A., Johnson, S.L. & Faith, M.S. (2006). Maternal restriction of children's eating and encouragements to eat as the 'non-shared environment': a pilot study using the child feeding questionnaire. *International Journal of Obesity*, 30(11):1670-1675.
- Kime, N. (2009). How children eat may contribute to rising levels of obesity: children's eating behaviours: an intergenerational study of family influences. *International Journal of Health Promotion & Education*, 47(1):4-11.
- Kime, N. (2008). Children's eating behaviours: the importance of the family setting. *Area*: 40(3): 315-322.

- Kirkpatrick, S.I. & Tarasuk, V. (2008). Food insecurity is associated with nutrient inadequacies among Canadian adults and adolescents. *Journal of Nutrition*. 138(3):604-612.
- Leung, M., Yeung, D.L., Pennell, M.D. & Hall, J. (1984). Dietary Intakes of Preschoolers. *Journal of the American Dietetic Association*. 84(5): 551-554.
- Lozoff, B., Corapci, F., Burden, M., Kaciroti, N., Angulo_Borroso, R., Sazawal, S. & Black, M. (2007). Preschool-Aged Children with Iron Deficiency Anemia Show Altered Affect and Behaviour. *Journal of Nutrition*. 137(3):683-689.
- Manios, Y. (2006). Design and descriptive results of the "Growth, Exercise and Nutrition Epidemiological Study in Preschoolers": The GENESIS Study. *BMC Public Health*; 6:32-39.
- Marshall, S.J., Biddle, S.J., Gorely, T., Cameron, N. & Murdey, I. (2004). Relationship between media use, body fatness and physical activity in children and youth: a meta-analysis. *International Journal of Obesity Related Metabolic Disorders*. 28(10): 1238-1246.
- Mason, M., Meleedy-Rey, P. Christoffel, K.K., Longjohn, M., Garcia, M.P., Ashlaw, C. (2006). Prevalence of overweight and risk of overweight among 3- 5 year old Chicago Children 2002-2003. *Journal of School Health*, 76(3): 104-110.
- McDermott, B.M., Mamun, A.A., Najman, J.M., Williams, G.M. O'Callaghan, M.J. & Bor, W. (2008). *Journal of Development in Behavioural Pediatrics*, 29(3): 197-205.
- McIntyre, L., Glanville, N.T., Raine, K.D., Dayle, J.B., Anderson, B. & Battaglia, N. (2003). Do low-income mothers compromise their nutrition to feed their children? *Canadian Medical Association Journal*. 168(6):686-691.
- Miller, S.A., Taveras, E.M. Rifas-Shiman, S.L. & Gillman, M.W. (2008). Association between television viewing and poor diet quality in young children. *International Journal of Pediatric Obesity*. 3(3):168-176.
- Moore, L.L., Lombardi, D.A., White, M>J., Campbell, J.L., Olivera, S.A., & Ellison, R.C. Influence of parents' physical activity levels on young children. *Journal of Pediatrics*: 118:215-219.
- National Association for Sport and Physical Education. 2002. Active Start: a statement of physical activity guidelines for children birth to five years. AAHPERD Publications, Oxon Hill, Md
- Needham, L., Dwyer, J.J., Randall-Simpson, J. & Heeney, E.S. (2007). Supporting healthy eating among preschoolers: challenges for child care staff. *Canadian Journal of Dietetic Practice & Research*, 68(2): 107-110.
- Newhook, L.A., Sloka, S., Grant, M., Randell, E., Kovacs, C.S. & Twells, L.K. (2009). Vitamin D insufficiency common in newborns, children and pregnant women living in Newfoundland and Labrador, Canada. *Maternal Child Nutrition*. 5(2):186-191.

- Northern Ontario Perinatal and Child Health Survey Consortium. (2003). Nutrition in Northern Ontario. Public Health Research, Education and Development (PHRED) Program Sudbury and District Health Unit.
- O'mara, L. (2008). Children who consumed sugar-sweetened beverages between meals >4-6 times/week at 2.5-4.5 years of age were more likely to be overweight at 4.5 years of age. *Evidence-Based Nursing*. 11(1): 24.
- Ontario Public Health Standards (2007).
http://www.health.gov.on.ca/english/providers/program/pubhealth/oph_standards/ophs_mn.html
- Orell-Valente, J.K., Hill, L.G., Brechwald, W.A., Dodge, K.A., Pettit, G.S. & Bates, J.E. (2007). "Just three more bites": An observational analysis of parents' socialization of children's eating at mealtime. *Appetite*. 48(1): 37-45.
- Pagnini, D.L, Wilkenfeld, R.L, King, L.A., Booth, M.L. & Booth, S.L. (2007). Mothers of preschool children talk about childhood overweight and obesity: The Weight of Opinion Study. *Journal of Pediatrics & Child Health*, 43(12):806-810.
- Pardee, P.E., Norman, G.J, Lustig, R.H. Preud'homme, D. & Schwimmer, J.B. (2007). Television viewing and hypertension in obese children. *American Journal of Preventative Medicine*. 33(6): 439-443.
- Public Health Agency of Canada. (2002). Canada's Physical Activity Guide for Children
http://www.phac-aspc.gc.ca/pau-uap/paguide/child_youth/pdf/guide_k_e.pdf
- Position Statement by the Dietitians of Canada, Canadian Pediatric Society, College of Family Physicians of Canada, and the Community Health Nurses Association of Canada. (2004). *The Use of Growth Charts for Assessing and Monitoring Growth in Canadian Infants and Children*. Accessed July 30th, 2009.
http://www.dietitians.ca/news/downloads/position_growth_charts_children_March_2004.pdf
- Randall Simpson, J.A., Keller, H.H., Rysdale, L.A. and Beyers, J.E. (2008). Nutrition Screening Tool for Every Preschooler: validation and test-retest reliability of a parent-administered questionnaire assessing nutrition risk of preschoolers. *European Journal of Clinical Nutrition*, 62:770-780.
- Reilly, J.J. (2008). Physical activity, sedentary behaviour and energy balance in the preschool child: opportunities for early obesity prevention. *Proc Nutrition Society*. 67(3):317-325.
- Rioboli, E. & Norat, T. (2003). Epidemiologic evidence of the protective effect of fruit and vegetables on cancer risk. *American Journal of Clinical Nutrition*: 78(3):5595-5695.
- Rock, C.L. (2007). Multivitamin-mineral supplements: who uses them? *American Journal of Clinical Nutrition* 85, Suppl., S277-S279.
- Rysdale, L., Brunelle, P., Randall-Simpson, J., Knee, C. & Keller, H. (2009). Evaluation of fruit juice intake and Body Mass Index within a sample of Ontario Preschoolers. Factsheet from Nutrition Resource Centre, Ontario Public Health Association.

- Rysdale, L. (2008). Evaluation of a nutrition education component nested in the NutriSTEP project. *Canadian Journal of Dietetic Practice and Research*, 69(1);39-42.
- Savage, J.S., Fisher, J.O. & Birch, L.L. (2007). Parental influence on Eating Behaviour: Conception to Adolescence. *Journal of Law, Medicine & Ethics*, 35(1):22-34.
- Schneider, J.M., Fujii, M.L., Lamp, C.L., Lonnerdal, B., Dewey, K.G. & Zidenberg-Cherr, S. (2008). The use of multiple logistic regression to identify risk factors associated with anemia and iron deficiency in a convenience sample of 12-36 mo-old children from low income families. *American Journal of Clinical Nutrition*, 87(3):614-620.
- Shields, M. (2005). Measured obesity. Overweight Canadian Children and adolescents. Analytical Study rep:1:1-34. Ottawa, Ontario: statistics Canada. Catalogue No. 82-620-MWE2005001.
- Stang, J., Rehorst, J. & Golicic, M. (2004). Parental feeding practices and risk of childhood overweight in girls: implications for dietetics practice. *Journal of American Dietetic Association*, 104(7): 1076:1079.
- Stroud, J., Hennesey-Priest, K.A., Keller, H., Rysdale, L, Beyers, J. & Randall-Simpson, J. (2007). Dietary Intake and growth of preschoolers (3-5 years old) living in southwestern Ontario. *Federation for Society of Experimental Biology Journal*, 21(6):1051-1054.
- Taras, H. (2005). Nutrition and School Performance at School. *Journal of School Health*;75(6):199-213)
- Taylor, R.W., Murdoch, L., Carter, P., Gerrard, D.F., Williams, S.M. & Taylor, B.J. (2009). Longitudinal study of physical activity and inactivity in preschoolers: the FLAME study. *Medicine & Science in Sports & Exercise*, 41(1):96-102.
- Tucker, P., Irwin, J.D., He, M., Bouck, L.M.S. & Pillett, G. (2006). Preschoolers dietary behaviours: parents perspectives. *Canadian Journal of Dietetic Practice & Research*, 67(2):67-71.
- Tucker, P., Irwin, J.D., Sangster Bouck, L.M, He, M. & Pollet, G. (2006). Preventing paediatric obesity: recommendations from a community-based qualitative investigation. *Obesity Reviews*, 7(3):251-260.
- Tucker, P., & Irwin, J.D. (2009). Physical activity behaviours during the preschool years. *Child Health and Education*, 1(3), 134-145.
- Van Horne, L., McCoin, M., Kris-Etherton, P., Burke, F., Carson, J., Champagne, C., Karmally, W., & Sikand, G. (2008). The evidence for dietary prevention and treatment of cardiovascular disease. *Journal of the American Dietetic Association*; 108:287-331.

- Ventura, A.K. & Birch, L.L. (2008). Does parenting affect children's eating and weight status? *The International Journal of Behavioural Nutrition and Physical Activity*. 5:15-22.
- Veugeliers, P., Sithole, F., Zhang, S. & Muhajarine, N. (2008). Neighbourhood characteristics in relation to diet, physical activity and overweight of Canadian children. *International Journal of Pediatric Obesity*. 3(3):152-159.
- Veugeliers, P.J. & Fitzgerald, A.L. (2005). Prevalence of and risk factors for childhood overweight and obesity. *Canadian Medical Association Journal*. 173(6):607-613.
- Wiley, A.S. (2009). Consumption of milk, but not other dairy products, is associated with height among US preschool children in NHANES 1999-2002. *Annals of Human Biology*, 36(2)125-138.
- Willows, N.D, Johnson, M.S. & Ball, G. (2007). Prevalence Estimates of Overweight and Obesity in Cree Preschool Children in Northern Quebec According to International and US Reference Criteria. *American Journal of Public Health*. 97(2):311-316.
- Witchel, E.C., Keller, H.H., Randal Simpson, J.A., Turfryer, M., McGibbon, K., Rysdale, L.A., and Beyers, J.E. (2009) Parent Perceptions of nutrition risk screening in preschool aged children. Unpublished
- PHRED Effective Public Health Practice Project Summary Statement. Effectiveness of interventions to promote healthy eating in preschool children aged 1-5 years. December 2001.