

Mount Saint Vincent University
Department of Applied Human Nutrition

**The Assessment of Food Management Behaviours that Influence the Diet Quality of Mother-
led Families in Nova Scotia**

By
Kristin Currie

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Abstract (summary)

We have shown in previous research that food management strategies adopted by low-income families may account for the difference in diet quality within households that have similar economic and structural characteristics. By studying these familial food policies we can better understand how internal and external factors influence diet quality, particularly for vulnerable populations, which may help to develop successful programs and health initiatives aimed at achieving and maintaining diet changes that reflect the recommendations in Eating Well with Canada's Food Guide.

The objective of this research was to validate the Food Management Assessment Tool; a tool designed to assess diet quality and food management strategies used by low-income households. The goal was to design a tool that could be implemented and interpreted by a health care practitioner with little or no nutrition background. This required three methodological objectives to develop and validate estimation tools to assess, 1) if a meal contains $\leq 30\%$ of food energy from fat; 2) if a food item is a limiting food; and, 3) if a non limiting food item is high in fat. Participants included 48 low-income mother-led families with at least two children between the ages of 2-14 living in Nova Scotia. The mothers completed one 20-60 minute face-to face interview in which they described the supper meal consumed by each family member and completed an interview administered questionnaire designed to assess Food Management Strategies.

The data was interpreted using Family Systems Theory. Results found that low-income families that use healthy food management strategies were 13 times more likely to have good diet quality than those that do not use healthy food management strategies. The overall Food Management Score includes components on healthy eating, formal meal structuring, meal planning and on whether or not the family is mother driven, as opposed to child driven. This

research was the first to develop an index score able to identify and classify families based on the functionality of their environment in relation to diet quality. Practitioners can use the tool we developed to assess clients and to develop, monitor and evaluate programs.

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List of Abbreviations

FBT: Food Behavioural Typologies
FMAT: Food Management Assessment Tool
CFG: Canadian Food Guide
EWCFG: Eating Well with Canada's Food Guide
DRIs: Dietary Reference Intakes
EAR: Estimated Average Requirements
AI: Adequate Intakes
UL: Tolerable Upper Intake Levels
RDA: Recommended Dietary Allowances
AMDR: Acceptable Macronutrient Distribution Range
EER: Estimated Energy Requirement
HEI-C: Healthy Eating Index-Canada
HEI: Healthy Eating Index
FGS: Food Group Score
DQI: Diet Quality Index
Kcal: Kilocalories
CCHS 2.2: Canadian Community Health Survey Cycle 2.2
FSNEP: The Food Stamp Nutrition Education Program
BMI: Body Mass Index
HPS: Healthy Plate Score
CNF: Canadian Nutrient File 2007
PPV: Positive Predictive Value
NPV: Negative Predictive Value
UREB: University Research Ethics Board
FRC: Family Resource Centres
MSVU: Mount Saint Vincent University
ANOVA: Analysis of Variance
GED: General Equivalency Diploma
OCD: Obsessive Compulsive Disorder
ADHD: Attention-deficit/hyperactivity disorder
IBS: Irritable Bowel Syndrome
GERD: Gastroesophageal Reflux Disease
s.d.: Standard Deviation
ns: Not Significant
FMS: Food Management Strategies
T1 or MD: Typology 1 Mother Driven
T2 or HE: Typology 2 Healthy Eating
T3 or FM: Typology 3 Food Sharing
T4 or MP: Typology 4 Formal Meal Structuring
T5 or FS: Typology 5 Meal Planning
SFP: School Food Policies
FNP for NSPS: The Food and Nutrition Policy for Nova Scotia Public Schools

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1.0 INTRODUCTION

Tailored nutrition interventions are more likely to improve diet quality than generic interventions (1-4). For this reason, health care providers would benefit from having tools to assess and differentiate their clients' needs based on individual circumstances, strengths and weaknesses in a timely and efficient manner.

Few community-based programs address family food management behaviours in relation to their environment (5, 6). This could explain why interventions that focus on nutrition education (7-9) and improving food skills (7, 9), show limited success in improving diet quality. Although there is a limit to the diet quality low-income households can achieve due to fiscal restrictions (10, 11), our previous research has shown that food management behaviours have an important influence on their diet quality (12).

The goal of this research is to expand on our previous work by developing and validating an assessment tool that contains both a dietary assessment and a behaviour assessment component. This tool will ultimately be used by service providers to tailor their nutrition interventions/programs based on the specific food management strategies adapted by their clients. The specific objectives of this research are:

- To operationalize the Food Behavioural Typologies developed during phase I of this research project into an easy to administer Food Management Assessment Tool;
- To revise the Healthy Plate Score for inclusion into the Food Management Assessment Tool so as to provide immediate feedback on diet quality without the use of computer software;
- To validate the Food Management Assessment Tool for use with low-income households.

1.1 Definitions

Food Security: a dynamic continuum of circumstances differentiated by the degree of ability or certainty “to acquire adequate, safe, nutritious and personally acceptable food” (13).

Food Insecurity: a state in which persons have uncertain “access to enough food for an active and healthy life” (14). The continuum of food insecurity begins with a fear of hunger, advances with parental hunger and maximizes with child hunger (15).

Household Food Security: having access at all times, through socially and personally acceptable means, “to enough food for an active, healthy life for all household members” (16).

Low-income Mother-Led Households: any single mother on income assistance, working for minimum wage or who makes equal to or less than \$25,000 per year (roughly \$12/hour for full time work), and any mother-led household that experiences diet restrictions due to limited fiscal resources is considered low-income (based on Statistics Canada’s low-income cut off¹).

Food Management Strategies: habits, rules, and behaviours that families adopt to guide day-to-day food choices. Strategies are limited to the food skills and nutrition knowledge held by family members and is highly influenced by the traditions, culture and beliefs the family hold about food. These strategies are often unknown to the family because they are simply accepted as normal behaviours.

Healthy Plate Score: a user-friendly assessment and educational tool that can be used to determine a proxy measurement of diet quality. The tool is designed so that it can be administered with minimal training in diet assessment techniques. The tool analyzes the supper meal and incorporates five nominal criteria including whether there is no more than one “limiting” food item; whether $\leq 30\%$ of total kcal come from fat; whether three of the four major food groups are consumed, with no more than one of those items being high in fat; whether the

¹ Refers to those for whom “spending on food, clothing and shelter takes up 20% more of their income than the relative amount spent by the average Canadian family for those necessities” (17)

meal contains more than three foods found in CFG's food groups; and whether the meal is home-cooked.

2.0 LITERATURE REVIEW

2.0 Introduction

A variety of factors contribute to the fact that many Canadian families do not eat a balanced nutritious diet as recommended in Eating Well with Canada's Food Guide (EWCFG) (10, 17-19). The collective beliefs, values and ideas that families hold about food help to develop diet standards within the household (12, 20, 21). These communal food standards are manifestations of both indirect and inherent aspects of the family's environment; consequently, it can be difficult to identify which factors influence the healthfulness of the family's diet. To some degree families adapt rules and strategies, which can be referred to as food policies, to uphold the family's behaviour so that it matches the family's food standards (20). These food policies can provide insight into the inner workings of a family and can also impact what families eat by helping them to manage food. Unfortunately, little is known about family food policies and how they relate to familial diet quality. By studying the policies adapted at the family level, we can better understand how internal and external factors influence diet quality. With the development of a food management assessment and educational tool, healthcare workers could base their advice on the food management strategies in such a way that their food choice capacity for healthy foods increases (12, 20).

2.1 Diet Quality

An assessment of diet quality reflects the degree to which the family complies with the recommendations made in EWCFG. Dietary intake can be assessed based on the amounts of nutrients, amounts of specific foods, food patterns or a mixture of the three (22). Many nutrition studies examine diet intake at the micro level by focusing on the specific nutrients and energy consumed rather than the types of food eaten. All nutrient analysis is flawed to some extent by inaccurate reporting. This can be due to memory lapse or failure to report. Analysis of nutrient

intake requires the use of food analysis programs to estimate intakes, which must then be interpreted to assess individual risk of inadequate intake. Studies that focus on nutrient intake do not provide insight into the actual food choices made by the individual or household (22) which is a concern because people eat food not nutrients. To put this into perspective, a nutrient –level screening tool could indicate that an individual has a low fiber intake; however, it would be impossible to know whether the low fiber intake is due to low total vegetable and fruit intake, a low total intake of grain products, or if it is related to the type of grain products, and/or vegetables and fruits selected.

Dietary intake can also be assessed by evaluating food intake relative to the food patterns recommended in EWCFG (22). This type of evaluation could include percent of energy from fat, percent of energy from “limiting” foods, and the number of food groups present. Assessing diet quality in relation to food patterns is beneficial because the outcome results in a list of practical recommendations. Assessments of food groups consumed shows which food group(s) the individual or group need to increase and/or decrease their intake of. This type of evaluation can also assess compliance with population level guidance for health such as the recommendation to eat a serving of dark green and orange vegetables everyday.

2.2 Dietary Reference Intakes

The EWCFG is a scientifically based assessment and educational tool that translates complicated nutrition research into practical diet recommendations for the Canadian population (23-25). Typically, dietary assessment is based on comparison of food and nutrient intake relative to a set of standards that support optimal health. As such, a goal or standard must be developed, along with a method for measuring the degree to which the standard has been reached. In Canada and the United States, the Dietary Reference Intakes (DRIs) are the most up-to-date recommendations for macro- and micronutrient intake (23, 24, 26). The DRIs, which are

derived for gender, age and life cycle stage (pregnancy, lactation) group consist of the Estimated Average Requirements (EAR), Adequate Intakes (AI), Tolerable Upper Intake Levels (UL), Recommended Dietary Allowances (RDA), Acceptable Macronutrient Distribution Range (AMDR), and the Estimated Energy Requirement (EER). When EWCFG was developed, it was modeled on the DRIs to ensure a low prevalence of inadequate nutrient intake within an energy intake that would promote healthy body weight. In doing so, experts believe that EWCFG will reduce the risks of diet-related chronic diseases within the Canadian population (25).

The DRI values can be used to both plan and assess dietary intake for both individuals and groups. The EAR represents the mean nutrient intake at which half the population will have met their nutrient requirement and half will not (26, 27) and is the value used to assess nutrient adequacy when working at the group/population level. In contrast, the RDA is set at a point where less than 3% of the population will have inadequate intake so is more appropriately used when working at the individual level. When an EAR is not set, usually due to insufficient scientific evidence, an AI is established (26, 27). AIs represent the expected mean nutrient intake for a group of healthy people and are probably above the true requirement for most members of the population (26, 27). The UL represents the largest daily nutrient intake that will not cause adverse health effects for the majority of the population (26, 27). The UL values are used, when available, to ensure diet and nutrient recommendations do not place a large proportion of the population at risk of excess intake.

The adequacy of macronutrient intake can be assessed by using the AMDR's and the EER. The AMDRs focus on healthy ranges for macronutrient intakes associated with optimal health. For example, fat has an AMDR of 20-35% of total energy intake; if the majority of the population fall within this range then fat modification would not be an area of concern. However, if the majority of the populations' diets fell short of 20% or surpassed 35% of energy

as fat, fat consumption would be an area of concern and would require strategies to either increase or decrease fat consumption (26). The AMDR values can also be used to set intake goals at the individual level (25, 28-30). The EER are used to assess and plan energy requirements for both individuals and groups (26). The EER values include an activity factor that can range from sedentary to very active (26).

2.3 Assessing Dietary Quality

In addition to meeting nutrient requirements, EWCFG incorporates practical messages to improve overall diet quality. For example, EWCFG recommends that Canadians consume a variety of foods; select low-fat, high-fibre, and nutrient-density foods from the four food groups; achieve healthy body weight through exercise; and reduce intake of fat (total, saturated and trans fatty acids), salt, alcohol and caffeine (24). The EWCFG also includes messages related to the quality of foods such as eat one dark green and one orange vegetable each day, and to make at least half of your grain products whole grain each day. Because of the relationship between the messages embedded in EWCFG and chronic disease risk, practitioners can use the guide to assess diet quality, to track diet changes, and to identify the strengths and weaknesses of a person's and/or a population's diet.

Using a scoring scheme to rate compliance with the dietary guidance messages in the Food Guide provides a numerical rating, or index score, of dietary quality (31). The Healthy Eating Index (HEI) is a widely used scoring scheme originally developed by the United States Department of Agriculture as a means to assess compliance with the Food Guide Pyramid and the Dietary Guidelines. Glanville and McIntyre (32) modified the scoring scheme to reflect Canadian dietary guidance to produce the Healthy Eating Index-C (HEI-C), an adjusted version of the HEI. The HEI-C consists of nine categories titled: Grains, Fruit and Vegetables, Milk, Meat, Other, Total Fat, Saturated Fat, Cholesterol and Variety. The maximum attainable score

for each category is 10 with the exception of the fruit and vegetable category, which has a maximum attainable score of 20 (32). The total maximum score of 100 can be categorized to reflect diet quality with a score of less than 50 corresponding to a poor diet, between 51 – 80 being a diet needing improvement, and greater than 81 being a good diet. Because the scoring scheme is proportional to energy intake, use of the HEI requires a food record/recall and nutrient analysis, which usually exceeds the resources available during community-based nutrition counseling.

The Food Group Score (FGS) is based on the number of food group requirements met (23, 31). According to this scoring scheme, marks are given if the diet contains at least one food from each of the food groups and a second mark is given based on whether or not the minimum servings are consumed from each food group (23, 31). Although shown to be effective in classifying poor diets, this index score is less sensitive for assessing overall health quality of the diet (31).

The Diet Quality Index (DQI) looks at macronutrient composition of the diet. This scoring scheme awards one point for meeting current recommendations for fat, saturated fat, cholesterol, carbohydrates and sucrose intake for a total score of five (31). This particular index is based on diet recommendations given by the United States, as Canada does not currently have recommendations on cholesterol and sucrose intakes (24).

Estimating the percentage of energy from fat is an important assessment component for nutrition interventions (29, 33-36). Health Canada identifies limiting fat intake as a component of eating healthy (25) because it helps to keep energy intake (kcal) within healthy limits, and as a means to reduce intake of fats with negative cardiovascular impact such as saturated fat and trans fat (29). Being able to assess the percentage of energy from fat in a quick and easy fashion would be useful in both primary and secondary interventions (28). Two such methods have been

developed in the past (28, 37). The Percentage Energy from Fat Screener, validated intake using a food frequency questionnaire and two 24-hr recalls, estimates the actual usual intake (i.e. “long-term average” (38)) for an individual (37, 38). Although useful and effective in determining a person's usual fat intake based on dietary habits held over a 12 month period, the tool is not designed to score an individual meal or to teach individuals how to build a meal that contains $\leq 30\%$ of energy from fat (37, 38). The Food Screener, validated using a 100-item food frequency questionnaire, was designed to identify persons with unhealthy intake of fat, fibre, fruits and vegetables. The Meat/Snack section of the screener can identify people that eat a diet with a high percentage of energy from fat defined as $>30\%$ of energy from fat (28). As with the Percentage Energy from Fat Screener, the Food Screen was designed to identify poor usual intake not to evaluate a single meal (28, 38).

2.4 Diet and Health

Diet has been implicated in increasing the risk of many chronic diseases including heart disease (39, 40), hypertension (39, 40), osteoporosis (41) diabetes mellitus (42), obesity (34, 43), and some cancers (33, 44, 45). Despite their preventable nature, these diseases are a major public health concern because of their alarming incidence rates (46, 47), potential impact on the quality of life for many Canadians (47), and cost to the health care system. The guidance embedded in EWCFG, which includes a variety of vegetables and fruits, whole grains, lower-fat milk products and leaner meats and alternatives, is based on prevention of these chronic conditions (41, 42, 48, 49). Unfortunately, many Canadians have not adopted the EWCFG's simple message on healthy eating and disease prevention (19).

The Canadian Community Health Survey Cycle 2.2 (CCHS 2.2) observed that Canadians are consuming too many high-energy-dense foods (defined as a food with high calorie content compared to nutrients) and not enough low-energy-dense foods (defined as a food with low

calorie content compared to nutrients) (19). Specifically they found that “limiting foods”, defined as foods that are mostly fat and mostly sugar, account for 22% of total energy intake, positioning these foods as the second largest component of Canadians’ diets (19). Moreover, 37% of 4-9 year olds and about 66% of adults over 30 consume less than two servings of milk products daily, and seven in ten children and one in two adults do not consume the minimum recommended amount of vegetables and fruits (19). These figures were drastically worse in the Atlantic Provinces with 79% of children and 67% of adults failing to consume the minimum recommended amount of vegetables and fruits (19). While it is clear that compliance with the food guide is poor, the reasons for this are not well understood.

2.5 Impact of Taste on Personal Food Choices

Taste preference is the most important determinant of personal food choices. The palatable sweet, high fat and salty foods have more favorable sensory responses than bitter or bland foods such as broccoli and pastas (50, 51). These savory delights, professionally termed “limiting foods” (25) are often energy-dense relative to nutrient content. While taste is important, it is not the only factor that influences consumer choice. As research has shown, food choices depend on a complex system of interwoven determinants that cause people to eat particular foods (1, 10, 14, 21, 50-59), which may be more accurately described as an outcome of circumstances rather than an outcome of choice. Just as motivations evolve, so to do taste; this may explain why adults may be more apt to consume healthy food choices compared to children (50, 60). Taste will continue to influence food choices, and for this reason, research shows that it would be beneficial to consider taste when developing nutrition programs.

2.6 Barriers and Enablers to Healthy Eating

Understanding the barriers to consuming higher diet quality has policy and program development importance for public health strategies and client counseling. Social policies, laws,

regulations, and food distribution systems can be linked to either limited or improved diet quality for Canadians (13, 25, 38, 61-66). In the United States, the National Institutes of Health have declared that the current national agriculture system, including the set price of food, prevents Americans from consuming the recommended amount of vegetables and fruit (38). This statement illustrates the multitude of factors that could potentially impact what individuals eat. It also helps to understand why dietitians have come to the consensus that food habits are better understood using the determinants of health approach rather than simplifying it to personal choices. Closing the gap in the information known about the barriers to healthy eating will lead to policies and counseling tools that are more able to support the healthy eating practices used by Canadians (67).

2.7 Food Insecurity

Food insecurity limits access to a high quality diet (66, 68, 69). Persons or households with uncertain “access to enough food for an active and healthy life” (14) are defined as being food insecure, a state that may adversely impact physical, psychological, social and societal health (13). In Canada, one in five children lives in poverty (18). In Nova Scotia, 14.6% of households reported experiencing food insecurity in 2004 (70), a statistic that may be as high as 96.5% when the focus is only on low-income mother-led households with two children under the age of 14 (66).

Food insecurity status varies depending on personal circumstances (61, 71, 72) but many believe that income is one of the most influential factors (10, 17, 61, 73, 74). The Nova Scotia Participatory Food Costing Study showed that a basic nutritious diet is unattainable by those living on minimum wage and income assistance because they do not have enough money to purchase the food regardless of their money management skills (11). A food costing study completed in 1997 demonstrated that purchasing a heart healthy diet in Nova Scotia costs 20%

more than a diet that consists of proportionately more fat, less fiber, and greater processed food (75)—all foods that would likely help to ease hunger without supplying optimal amounts of nutrients (57, 76). The maximum attainable diet quality for low-income families is likely to fall short of the optimal diet recommended by EWCFG because they simply do not have access to enough resources. As demonstrated by Drewnowski and colleagues, nutrient dense foods are more expensive than foods that ease hunger but provide less nutrition, causing an added incentive to purchase less healthy foods (57, 76, 77). Because of the cost of higher quality foods, education programs that focus on knowledge without regard to purchasing resources are not likely to be successful in changing food behaviours.

2.8 Beyond Income: Other Factors that Affect Food Security

Food insecure families may adopt unhealthy coping strategies to survive.

Socioeconomically disadvantaged Canadians struggle to meet the diet quality standards outlined in the Food Guide. The fear of food wastage may prevent a family from purchasing novel and perishable foods (78). This strategy, described as static food purchasing to reduce risk, may limit the variety in the diet (78). Families that practice this strategy believe that if members of the family do not like the new food item, or refuse to try the new food item then food will be wasted and the family will be put at an increased risk of food insecurity.

Some low-income families also rely on foods donated by food banks. Because donations are inadequate to meet needs (58, 68) and the quality of the donated food is sometimes poor (79, 80), this strategy may place the family at risk for consuming unsafe foods and a diet that does not meet EWCFG's guidelines. Recipients have indicated that sometimes donated food is damaged and/or outdated (79, 80), and important components of EWCFG, including fresh vegetables, fruits, milk and lean meats, are usually limited or not available (58) because donations are usually restricted to non-perishable food items (80). The majority of food bank users report that

they rely on a few low-cost foods to survive (68). Despite their good intentions, food banks do not prevent hunger, as upwards of 56.9% of food bank users have reported experiencing hunger in the past 30 days (68).

For low income families, food availability fluctuates in relation to the income cycle (79). This leads some food insecure families to eat in cycles, over-eating when food is available and under-eating when food resources become scarce (79). Some have suggested that cycle eating predisposes to weight gain because overtime it can interfere with metabolic patterns and internal satiety cues (81) but we were unable to find clinical research to support this claim.

While income restrictions are preventing some Canadians from purchasing the foods needed for optimum health (17, 82-84), money does not always predict healthy dietary choices (19, 59). Food insecurity is not restricted to low-income households (22). Lack of cooking skills, nutrition knowledge and time may be just as detrimental to food security status as lack of monetary resources (22, 59, 61). For instance, having lack of time and/or food skills may decrease a family's ability to prepare homemade meals. In turn, the family may rely on ready-made processed foods and/or foods made in restaurants, which would likely lead to an excess consumption of fat, food energy and nitrates and an inadequate consumption of nutrient dense foods. Furthermore, the CCHS 2.2 found that 15% of low-income households consumed diets that contained >35% of kcal from fat compared to 25% of households within the highest income bracket (19). This result seems to represent the idea that having the available financial resources to purchase a healthy diet does not necessarily lead to the consumption of a healthy diet. It has also been observed that there is a gradient in diet quality amongst individuals living with similar financial and structural situations (12, 22). In other words, groups categorized solely on socioeconomic factors have heterogeneous characteristics in regards to diet quality. This

suggests that other factors or determinants, besides income, must be influencing the diet quality of those with limited resources to purchase food.

Dietary styles might be one of the factors that contribute to the differences in diet quality found amongst similar households. When dietary quality was assessed in relation to the Food Guide Pyramid using the HEI, distinct dietary styles were found to be adapted by low-income children (22). Although this phenomenon was unable to link a specific dietary style to diets that meet all guidelines recommended by the Pyramid, some dietary styles were more likely to yield higher HEI scores than others (22). These findings suggest that income is not the only variable that should be considered when investigating diet quality for low-income households.

2.9 Food Skills and Knowledge

Diet quality is related to nutrition knowledge (52, 85), food skills (52, 85), and personal attitudes toward diet and health (73, 86). Based on this relationship the Food Stamp Nutrition Education Program (FSNEP) aims to improve the food choices made by individuals with limited resources by teaching nutrition knowledge and food skills that support the development of healthy attitudes about food (9). An evaluation of the program found to have a marginal, yet significant ($p = .001$) affect on the amount of vegetables (increased by 0.8 ± 1.4 servings), fruits (increased by 0.7 ± 1.4 servings) and milk products (increased by 0.4 ± 1.7 servings) eaten. The majority (~70%) of participants in the FSNEP reported using healthy cooking methods (lard vs. oils) and food budgeting skills (meal planning, using shopping lists and comparing prices) (87). Another larger evaluation study found that participants in the FSNEP were 20% more likely to engage in healthy grocery shopping practices (e.g. comparison shopping) compared to the general US population. However, 49% of FSNEP participants did not adapt the healthy practices promoted by the program (52) and diets continued to be less than optimal (87). These results challenge the notion that low-income families lack high diet quality due to poor food skills

and/or knowledge as compared to the general population and suggest that other factors play a role in food choice behaviours of low-income Americans.

Being aware of the health value of foods and planning meals can improve diet quality (52, 73). Secondary data analysis of the 1996 National Food Stamp Program Survey, and the Expanded Food and Nutrition Education Program, determined that grocery shopping practices are associated with diet quality (52). This analysis showed that “thinking about healthy food choices” and meal planning were two behaviours that significantly improved the likelihood of consuming 100% of RDA for vitamin C ($p \leq .01$), vitamin A ($p \leq .01$), vitamin B6 ($p \leq .01$) and iron ($p \leq .05$) (52). Some women within all income brackets, including those with incomes $>350\%$ of the poverty line, consider the price of food while shopping. The degree to which they prioritize price as an important factor in their buying practices is associated with their diet quality (73). On average, the diets of the shoppers who recognized price as being “very important” contained more food energy, more energy dense foods, and contained fewer nutrient dense vegetables when compared to shoppers who did not consider price to be very important (48, 73).

The amount of times families eat homemade food and the “complexity” of the preparation are predictors of diet quality (88). When considered in relation to food security, lack of cooking skills increased the risk of being food insecure independent of household income (72). Research has confirmed the impact of nutrition knowledge, healthy attitudes and food skills on diet quality. The question now is how can we help to change people’s environments so they can adopt these healthy behaviours?

2.10 Parental Feeding Practices

Food rules and feeding practices used by parents can influence the healthfulness of their children’s diets (89-92). Specifically, the child-feeding practices used by mothers are linked to the energy intake and body weight of their children (90). These same practices have a direct

influence on the child's ability to monitor intake using internal hunger and satiety cues (93).

Children who eat with their parents consume more nutrients and derive a smaller percentage of energy from saturated and trans fatty acids than those children who only eat with their parents some days or who never eat with their parents (92). Parental feeding practices that restrict unhealthy food choices may have the most impact on the health outcomes of children (94). In contrast, in child-led families, parents allow the children to control their own food intake and they often use food for “non-nutritive” purposes such as a reward and/or to reduce conflict in the home (89). Child-led families are less likely to restrict foods that could predispose to poor health outcomes (89). The impact of limiting foods in childhood can continue into later life. For example, children who had restricted intake of unhealthy foods before age 10 were less likely to consume unhealthy foods as adolescents (54). This is a significant determinant of diet quality because these food management behaviours directly influence the types of foods eaten, the portion sizes of meals and the cooking methods used by individuals (21, 54).

2.11 Food Habits

When making food choices, the usual practice is to prefer what is familiar. Food rules and management strategies are instilled into intergenerational food choices (21). This means that habits that impact the diet quality and ultimately the health of family members are passed down through generations such that food habits, rules and choices taught in childhood continue to have an impact throughout adulthood (20, 54).

2.12 Food Sharing

Parents adopt strategies for allocating food resources among members of the family. The “fairness concept” proposes that resources can be distributed in three ways: equally based on the quantity and quality of food, equally based on needs for nutrients and energy, or unequally based on favoritism, investment in the future or cultural norms (95). For example, two motives could

cause male members of the family to receive higher proportions of the family's resources, a phenomenon sometimes observed in families (96); families from male-dominated societies may hold a gender bias that favours males, or females could have smaller dietary requirements and therefore would require less food to meet their nutrient and energy needs (95). If the same proportion of food requirements is met for each member of the household then diet allocation within the household is deemed to be equal.

The "fairness concept" followed by the family is highly dependent on the culture in which the family belongs (95). Theoretically, in collectivist cultures such as China, similar resources and similar needs met would be seen as the norm within the family structure, unless it was believed that providing one member with more would benefit the family or society as a whole. In some cultures, males are often viewed as being more useful or more valuable than females. This may explain why, in some collective cultures, males receive more than their fair share of the food as compared to their female counterparts. In contrast, in individualist cultures, such as Canada, an expected norm is an unequal construct (95). This phenomenon is typically seen when parents skip a meal so that there is enough food for their children to eat (32).

In food insecure Canadian families, children are protected against hunger as much as possible (15, 19, 69). According to the gradient of food insecurity, fear of hunger is followed by parental hunger with the children experiencing hunger only in extreme situations (15). A 2003 study, which assessed dietary intake of lone-mother led families residing in Atlantic Canada over a month long income cycle, found mean energy and nutrient intakes to be significantly less for mothers compared to their children supporting the notion that mothers compromise their own diet to feed their children (69). Two of the most common food allocation rules supported in the literature are that males are given more and mothers are given less. In these situations, some members of the family may be more vulnerable to having an inadequate consumption of energy

and nutrients than other members of the family, potentially leading to an increased risk of compromised health. Therefore, the rules families use to allocate food resources have the potential to affect the food and diet quality available to each member of the household.

2.13 Literacy

Low literacy can hinder a person's ability to read food labels and medical pamphlets making it more difficult to follow and receive nutrition advice, and to assess the healthfulness of their diet (97). In 2003, 42% of Canadians between the ages of 16 and 65 scored below the required literacy level for knowledge economies such as Canada; this figure equates to nine million people (98). Even more worrisome, 60% of adult Canadians lack the health literacy skills needed "to obtain, understand and act upon health information and services and to make appropriate health decisions on their own" (97). One of Canada's national public health goals is to ensure health services are accessible to all (99, 100). Therefore, when developing educational tools it is imperative that the tool is developed so that a person with low-literacy levels can use the tool.

2.14 Benefits of Tailoring Educational Programs

Health messages and interventions are often tailored so that they relate to specific categories of people (2, 56). Although general nutrition guidelines and recommendations are developed for the Canadian population, the task of getting Canadians to adopt these guidelines is complicated because of the heterogeneity of the population (2, 3), which causes individuals and groups to react differently to the same messages and interventions (2, 3). The goal of nutrition counseling is to empower individuals to take control of their health by breaking barriers and building enablers to healthy lifestyles (4, 101). This may involve increasing clients' readiness to change (1, 56), knowledge about nutrition (52, 85), food skills (72), and access to food (72) and exercise opportunities. Many programs focus on behavioural (1, 2) cognitive (1, 3, 56) or

environmental (1, 56, 102) changes, a combination of the three (1, 2, 56) or all three when a systems lens is used to guide the program, to help persuade people to change lifestyles.

Tailored interventions assess which factors affect the client and then work with the client to help them overcome these barriers through behaviour or cognitive changes (1, 4). There are many variations of tailored counseling, each have differing degrees of personalization based on the amount and complexity of the factors the intervention incorporates (1, 2). The tools can be personalized for each client or for a specific group. When tailoring for groups, variations of the tool, print material, or intervention, are pre-developed, clients are assessed, categorized based on the assessment and placed into the program that suits them best. For instance, there are specific programs aimed at either primary or secondary prevention for heart disease, diabetes mellitus, osteoporosis, and weight loss. Typically, each class is reserved for only those persons that meet a set criterion, e.g. having a fasting plasma glucose level of 7.0 mmol/L or a Body Mass Index (BMI) >25. This is because, for instance, the information given at a diabetes mellitus education session would not be relevant or useful to a patient with osteoporosis. Using the same argument, it is inappropriate for a single mother with excellent cooking skills and nutrition knowledge to attend a program aimed at improving diet quality by improving those attributes she already possesses. Therefore, assessment tools are needed to place clients into proper programs and to determine which factors need to be incorporated into the tailored nutrition program (1, 2, 56, 103).

Tailoring health education tools to the specific needs of clients, based on stages of change (1, 2, 56), culture (2, 21), preferences (e.g. likes and dislikes) (2, 3) and socioeconomic status (e.g. income and education level) (9), increases the likelihood that the tool will have a positive influence over the target population. To illustrate this point, researchers evaluated the outcomes of providing nutrition counseling via computer feedback forms in terms of the importance of

tailoring the information for each client using three types of feedback: 1) non-tailored in which participants received a standard feedback letter containing general nutrition information, 2) tailored, in which participants received a tailored feedback letter based on the “dietary intake, intentions, attitudes, self-efficacy expectations, and [the] self-rated behaviour(s)” (103) of the participants, and 3) tailored plus additional feedback on behaviour and intentions to change based on personal information collected post-survey (103). The tailored feedback resulted in greater behaviour change as evidenced by a greater reduction in fat intake and an increase in vegetable and fruit intake. The intervention that received the additional feedback resulted in the greatest fat reduction (103). Since tailored nutrition interventions are more likely to improve diet quality than generic interventions (1-4, 103, 104), healthcare providers would benefit from having tools to assess and differentiate their clients needs based on their unique individual circumstances.

2.15 Gaps in Educational Programs Currently Available

Recognizing the food management strategies that families use to guide their food decisions in the context of their environment including cultural, social, economic, and personal forces, service providers will be more able to adapt their messages and programs so it will have greater meaning and effect for their clients (20, 59).

Few studies have looked at the impact of environmental conditions, such as household food rules and management strategies, on diet quality (52). Healthcare workers report that life experiences, attitudes about nutrition and health, and specific behaviours of the mothers of the households they counsel act as barriers to healthy eating (105). In order to be effective, they felt that it would be beneficial to consider the “social context and personal goals” (105) of their client during counseling. To achieve this outcome requires a shift in the priorities such that more time is allocated to counseling and less to dietary assessment. This supports the need for the

development of a tool that quickly assesses diet quality to allow more time to be spent on counseling. The literature also supports the development of an assessment tool that would help to incorporate the life experiences, such as family behaviour rules and strategies, into the development of nutrition programs (20, 89, 105).

3.0 THEORETICAL FRAMEWORK

Family Systems Theory informed the development of the Food Management Assessment Tool. Systems theory provides a way to understand the family as a functional entity that is both separate from and impacted on, and by, its environment (106). Family Systems Theory views the family as a “superpersonality” that has a reciprocal relationship with its immediate and indirect environments (107). Family systems theory categorizes the environment into levels:

- Microsystem – the direct environment, such as the family itself, the school the children attend and the workplace of the parents (107).
- Mesosystem – the interactions that occur within and between these environments (107).
- Exosystems – the indirect relationship between the family and larger institutions, such as the child tax benefit, minimum wage rates and provincial school policies on food programs, such as the breakfast and milk programs (107).
- Macrosystem – the attitudes, values and cultural laws (107).

These systems combine to make up the suprasystem (107).

There are subsystems within the family system comprised of two or more family members (106). In the instance of a lone mother family, the subsystems may be between siblings or it may be between the parent and one or more child. Behaviours within the system are interpreted through circular interactions found within the subsystems (106). Therefore, the behaviour and the process becomes more important than the cause; making it less likely to blame and easier to direct the focus on finding solutions to the problem.

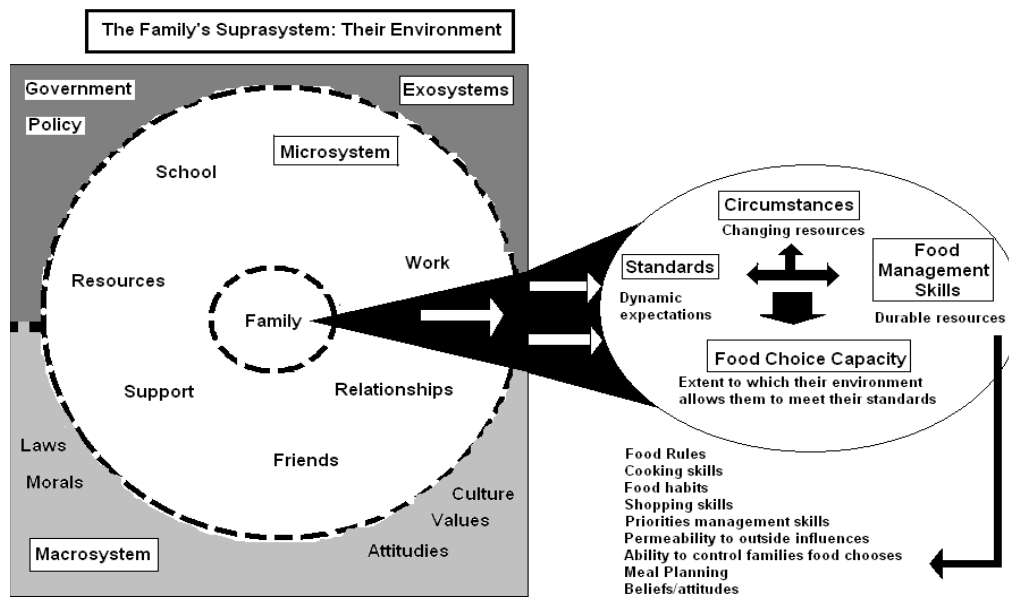


Figure . A schematic of Family Systems Theory in relation to food management skills; adapted from figure 2 in Bisogni C, Jastran M, Shen L, Devine A. A biographical study of food choice capacity: Standards, circumstances, and food management skills. J Nutr Educ Behav 2005;37:284---291

Family Systems Theory, a derivative of Systems Theory, is grounded in seven assumptions (106) that can be used as a framework from which to analyze the family. These assumptions include the following:

3.1.1 Whole is greater than the sum of its parts

Families are more than just a group of individual members; and for that reason, families cannot be fully understood without knowing the historical context and internal beliefs, values and ideas that are brought to the system by each member. The family system is a strongly bonded entity that can withstand conflicts and even death; and has traditions and influences that are passed down through generations (20, 108). Therefore, persons are forever linked to each family system they join; and consequently, family systems have only the ability to grow and evolve. The strong bonds within a family can act as both barriers and enablers to healthy eating

behaviours because many people eat as they were raised to eat (20, 21, 54). This perpetual cycle of eating behaviours could be harnessed to help instill healthy eating practices within families.

Some behaviour may be caused by obscure factors that seem to be removed from the family. Family norms and traditions about food that do not seem to serve any particular purpose may have served a purpose at a previous time, even in a previous generation. For example, a parent may hold the belief that you must finish everything on your plate to reduce wastage because they were taught that by their parents. This eating practice may cause children to eat more than is physiologically necessary and may hinder the child's ability to recognize appetite cues (90, 109). It may also inadvertently cause increased incidence of hunger because food is consumed rather than saved for when the child is hungry.

3.1.2 Broad Range in Functioning

Many inputs can achieve different outcomes. Instead of saying that the family consumes a low quality diet, through the lens of Family Systems Theory, one would say that the family system is affected by unhealthy influences that lead to a compromised diet quality. In a positive context, healthy direct and indirect influences would support the family to eat a quality diet. For example, two families may be placed in identical financial situations but depending on the functionality of the family one family may be more able to adapt to the situation and therefore would have less risk of being food insecure. Furthermore, each family member may react differently to the situation depending on their perception of the situation and available support systems.

Problems within the family are seen as being a function of struggle “between” persons not “because of” persons (107). With the example of the parent perpetuating the idea of eating everything on your plate, it would hold little benefit to confront the cause of the problem, which in this instance could be a family member that no longer lives with the family or who may not be

alive. Furthermore, one could argue that the philosophy is a product of the times during which the parent was raised. Instead, it would be more beneficial to explore why the parent feels that the children should eat everything on their plate. It could be because she wants to ensure her children receive adequate nutrients, it could also be because this is the only way she feels she can get the child to eat, or she may not hold any particular reason because she has simply accepted the action as normal behaviour. Either way, the important aspects are the action and the reason(s) why the action seems necessary, not the cause of the action.

3.1.3 Rules and Homeostasis-meaning that implicit and explicit rules are used to keep the family in balance as an unbalanced system leads to chaos

When using Family Systems Theory to build a heuristic outlook of the family one would start by asking what need a particular behaviour is satisfying or what goal a behaviour is trying to meet. Family goals influence the family's diet standards and are influenced by the environment in which the family lives. As a result, not all environments have the capacity to provide a high diet quality without incorporating change (10, 20, 21, 71, 72, 77, 79, 80, 83, 102) i.e. high diet quality may not be possible without increased financial resources, or improved access to nutrient dense foods.

Families rely on rules to keep their system (the family) in balance. "first-order rules" are made to uphold "higher-order rules" (106); for example, if the higher-order rule was that all members of the family were to receive optimal nutrition then one would assume the diet quality would be relatively high in this family. If the higher-order rule was defined as the absence of hunger then one could assume that the family would be more preoccupied with quantity rather than quality, and may be more likely to adopt unhealthy eating practices. Both higher-order and first-order rules can influence the foods families eat e.g. the first-order rule of "eating everything on your plate" may have been developed to meet the higher-order rule of receiving optimal

nutrition, in which case, the practitioner may be more likely to motivate the mother to abandon this rule if it leads to poor nutritional intake. If the family was using the “eat everything” rule to meet the higher-order rule of preventing hunger than it may be more relevant to discuss the negative impact the rule is having on the families level of food security.

This concept may also explain the eating strategy termed static food purchasing wherein families may not sway from their usual diet because of fear of food wastage. This action may cause the family to be bound to a poor diet because the “first-order rule” of reducing waste hinders the “higher-level rule” of providing the family with adequate nutrition.

Families have many explicit and implicit rules. For instance, there may be an unspoken rule that the male members of the household are to get a larger portion of meat compared to the female members of the family; or that the mother eats after the children. Another unspoken rule might be that the mother prepares more than one meal during dinner to satisfy the demands of a fussy eater. Each of these rules may be made with the goal of decreasing hunger in the house, or to decrease conflict in the house or it may be a normal learned behaviour that the family does not realize is unnecessarily wasting time and financial resources.

3.1.4 Feedback to Maintain Homeostasis

When family members receive new information or when they try to change behaviour, the person receiving the information or another member of the family will counteract with either positive or negative output in order to preserve the family’s homeostasis. Positive feedback, also termed “deviation amplifying”, may prevent a goal from being reached (106). For example, consider the family who has a fussy eater who takes a tantrum when given new foods. If the parent prepares a new meal for the child then the child has succeeded in resisting the change. If the parent chooses to make the child stay at the table until they finish eating everything on their plate, then conflict will grow in the home and lead to chaos at which point, the parent is likely to

stop trying to get their family to try new foods. In both cases, the action or inaction of the family member causes the family to deviate further from the goal of providing proper nutrition for the family. Alternatively, if the parent introduces one new food item at a time and only requires the child to try the item each time it is served, the change will be met with less resistance and the child will be more likely to develop a taste for the food item. The latter option is an example of negative feedback or is a “deviation dampening” response because it is the option that coincides closest with the family goal.

The food choices made by the family “co-evolve” and are in equilibrium with the system. The more unhealthy food choices are adopted and embedded within the system the greater the resistance to change. Therefore, the behaviour “eating unhealthy foods” is enmeshed with the equilibrium of the system and any change has the potential to cause conflict within the family. To reduce conflict, Family Systems Theory supports solutions developed by the family together as a unit (90). By allowing all members of the family to be involved in the development phase, implementation will be met with less resistance.

3.1.5 Family members have roles that maintain homeostasis

According to Family Systems Theory, the parent(s) should run the household and establish clear boundaries for the children to follow. When this hierarchy is broken, i.e. when a parent deviates away from their main role, it is difficult to regain control over the family and if this occurs, the parent might not be able to control the foods the children eat potentially allowing the children to consume more unhealthy foods.

Knowing each family member’s role is important because it helps to understand the reason why particular behaviours are occurring. If family food choices are controlled by a parent, the cause of eating unhealthy food choices may be because of a variety of factors such as increased availability of unhealthy choices, insufficient financial resources, and limited cooking skills and

nutrition knowledge. Similarly, if the child's role is to control food choices, they may be motivated by another set of factors such as the need for freedom, rebellion, happiness, satiety and/or acceptance of peers. Furthermore, some members of the household, known as peacekeepers, may compensate for a fussy eater. The peacekeeper may be a child who will eat anything or eat less to allow a more dominant member of the family to get their way.

3.1.6 Families have boundaries

Communication boundaries protect family functionality by filtering “threatening” information and permeating information that enables or supports a family's current way of functioning. Some families may not be willing to listen to nutrition advice because they do not believe they are in a situation to adopt the changes. Therefore, health advice need to be promoted using approaches that empower people to believe that they are capable of adopting the recommended lifestyle changes.

3.1.7 Variety

Families rely on specific food management strategies to keep their system (the family) in balance. Food management strategies are durable resources that help the family meet the demands of a new environment (59, 106, 110). A family that has a strong variety of food management skills is more able to adapt to the demands of a dynamic environment. For example, a family with fussy eaters may lack the flexibility to change their protein sources from high to low-cost options (chicken vs. legumes) if the family were to undergo financially difficult times. Furthermore, having limited cooking and budgeting skills and nutrition knowledge may prevent a family from incorporating a low-cost protein source because the family may not know how to cook the items, may lack the skills needed to make the food more palatable, or may lack the knowledge needed to develop the lower cost strategy.

3.2 Application

When families practice poor eating behaviours, steps must be taken to understand the barriers that have prevented adoption of healthy eating practices in the first place (20). Using the lens of Family Systems Theory, it is possible to use the suprasystem to identify the norms that exist within, between and surrounding the everyday reality of the family (20, 21). This would allow the family to become aware of the factors that affect food choices and to develop management strategies to help change their suprasystem so that it supports a higher diet quality for its direct members (20). Having a greater understanding of the family's reality allows for a more empathetic approach—a skill that supports effective communication and counseling (20).

The fundamental concepts of Family Systems Theory support the notion that food choices are influenced by personal, environmental, social and cultural attributes (1-3, 20, 52, 56, 59, 61, 82, 83, 86, 89, 90, 102, 105). By using Family Systems Theory, the focus will be on the more complex relations occurring between and within family sub-systems rather than the individual members. Therefore, solutions to a problem are found through analyzing the social environment in which it occurs.

3.0 METHODS

4.1 Background: Phase I Research

This research was a continuation of the “The Impact of Intrafamilial Food Distribution Patterns on the Diet Quality of Poor, Mother-led families in Atlantic Canada” research study. The first phase of the study consisted of secondary analysis of the “Hungry Mothers of Barely Fed Children” dataset to investigate food management behaviours with the intent of explaining the differences in diet quality found within a family unit (12). The study reexamined the transcripts and field notes from the in-depth face-to-face interviews (12) completed by a subset of 24 lone-mother families purposively selected to represent a variety of education levels, income status, food security status, ethnicity, geographical location and housing arrangements (12). The intent of the secondary data analysis was to examine intrafamilial distribution of food within a household to determine whether position of household membership and other household characteristics could affect the diet quality of individual family members (12).

Families in the original study also participated in a 24 hour dietary recall of all foods and beverages once a week for one month. Mothers reported on behalf of their children who were present at the interview if possible. The recalls were used to develop a “Healthy Plate Score” (HPS), as a proxy measure of diet quality based on the supper meal and incorporates five factors (12) (**Figure 2**). The HPS for the evening meal was compared to the HEI based on the total days food intake HEI ($r=0.415$, $p<0.005$).

Healthy Plate Score	
1.	Do servings from “other” represent $\leq 15\%$ of total kcal?
2.	Is the percent kcal from fat $\leq 30\%$?
3.	Does the meal have 3 of the 4 major food groups present?
4.	(Yes to #3) and no more than 1 food comes from the high-fat subcategory of CFGHE
5.	There are more than 3 foods eaten at the meal?
6.	Is the meal home-cooked?

Figure . Health Plate Scorecard from Phase I

Phase I of this research project yielded dichotomous food management typologies to explain the gradient in diet quality within low-income households of similar structural characteristics (**Table 1**).

Table . Phase I Food Behaviourial Typologies with Reliability Scores

Typology 1: Child-Driven Menu vs. Mother-Driven Menu – Cronbach’s alpha = 0.66	
❖	“Peer pressure”, “fitting-in”, or other child-centric rational a reasonable explanation for food choices? (* Y- child driven, N- mother driven)
❖	There are child picky eaters in the house? (Y – child driven, N- mother driven)
❖	The mother prepares only one supper meal (any meal?) for the whole family? (Y – mother driven, N- child driven)
❖	The foods brought into the household seemingly based on mother’s preference? (Y – mother driven, N – child driven)
Typology 2: Subsistence Eating vs. Healthy Eating – Cronbach’s alpha = 0.66	
❖	Three “meals” are consumed through out the day by each family member? (may or may not satisfy at least 3 of 4 food groups present at the meal; Y – health eating, N – subsistence eating)
❖	Late-night snacking occurs (either mom or child)? (Y – subsistence eating, N – healthy eating)
❖	Anyone in the family relies on less than 6 different foods throughout the day? (Y – subsistence eating, N – healthy eating)
❖	The household is food secure at any time over the month? (Y – health eating, N – subsistence eating)
❖	The family consumes the same foods on a day-to-day basis? (Y – subsistence eating, N- healthy eating)
❖	Healthy foods are rationed (hidden, locked-up, etc)? (Y – healthy eating, N – subsistence eating)
❖	Deliberate thought is given to choosing healthy meals and/or snacks? (Y – healthy eating, N- subsistence eating)
Typology 3: Food privileging vs. Sharing food – Cronbach’s alpha = 0.284	
❖	A family member has special dietary needs (pregnant/breastfeeding mom, other)? (Y – food privileging, N – sharing food)
❖	Children eat before the mother? (Y – food privileging, N-sharing food)
❖	Healthy/nutritious foods are shared amongst family members? (Y – sharing food, N – food privileging)
❖	Family members do not access food programs other than those offered at Parent/Family Resource Centre? i.e. School lunch program, breakfast program (Y – sharing food, N – food privileging)
❖	The youngest children are favored compared to the older children with respect to food? (Y – food privileging, N – sharing food)
Typology 4: Informal vs. Formal Meal Structure – Cronbach’s alpha = 0.62	
❖	Meals are eaten as a family? (Y – formal meal structure, N –informal meal structure)
❖	Food eaten throughout the day (not as “meals” – grazing)? (Y – informal meal structure, N – formal meals structure) (? Foods are eaten as wanted, rather as set meals)
❖	Supper is eaten in front of the TV or in a non-conventional room? (Y – informal meal structure, N-formal meal structure)
❖	Meals are eaten at “typical times”? (Y – formal meal structure, N – informal meal structure)
Typology 5: Ad Hoc Food Consumption vs. Meal Planning – Cronbach’s alpha = 0.61	
❖	Over the course of the day, the mother demonstrates cooking skills such as baking, broiling, steaming, preparing foods from scratch? (Y –meal planning; N –ad hoc)
❖	The mother budgets for meals? (list to store. Etc) (Y – meal planning; N- ad hoc)
❖	The family consumes foods that are ready-made? (Y –ad hoc, N-meal planning)

4.2 Phase II Research Approach

The objective of Phase II was to operationalize and validate a Food Management Assessment Tool based on the Food Behavioural Typologies and the Healthy Plate Score created during Phase I. The goal was to design a tool that could be implemented and interpreted by a health care practitioner with little or no nutrition background.

4.3 Food Management Assessment Tool

The factors outlined in the Food Behavioural Typologies, shown in Table 1, were operationalized into closed-ended questions (Appendix A). Each typology is comprised of several constructs (Figure 9). One or more questions were added to the questionnaire to measure each construct. Specific wording for the questions was adapted from previous research when possible. Questions were formatted to yield dichotomous responses e.g. yes/no questions or response along a continuum of healthy versus unhealthy behaviours (1-4 scored as a healthy response, 5-10 scored as an unhealthy response). Both positive and negative questions were incorporated into the questionnaire to employ balanced item keying. Some constructs could be viewed as both a negative and a positive behaviour depending on the context in which it was used e.g. if special meals were made due a medical condition like celiac disease. Questions were added to the questionnaire to differentiate between families that had a legitimate reason for practicing behaviours typically viewed as unhealthy from those that did not. Face validity for the assessment questionnaire was obtained from experts in research methods, nutrition and public health. The questionnaire was then pilot tested to ensure clarity and readability of the tool. The researcher continuously reviewed the notes about the understanding and use of the tool to make necessary wording and response option changes to improve comprehension and clarity of the tool.

4.4 Healthy Plate Score

The HPS was designed so that someone can administer it with minimal training in diet assessment techniques. Because users can score a meal within minutes without computer software, the HPS provides immediate feedback to participants.

For the original HPS, the four independent dietary recalls for all members within the selected families (n=24 mothers, 30 boys, 25 girls) were analyzed for percent of energy from fat and percent of energy from limiting foods using Food Smart Millennium Professional Edition (Sasquatch Software Corporation, Vancouver, BC) nutrient analysis program. The “Thresholds for Assessing Foods to Specific Groups or Subgroups” (111), developed by Health Canada was used to determine if a food was considered high fat or a limiting food.

During Phase II, the original HPS was adapted so it could be completed without the use of nutrient analysis software. In the revised HPS, the question pertaining to limiting foods asked if the meal contained more than one limiting food. Health Canada does not provide serving sizes for limiting foods. For the purposes of the study, serving sizes were developed based on calories and/or typical serving sizes consumed by the general population. Limiting foods were restricted to those identified in EWCFG, and to items with fat percentages equal to or greater than the thresholds developed by Health Canada. For consistency, food items classified as high fat by the thresholds that contain small amounts of calories and fat are not classified as high fat by the HPS. Condiments such as ketchup and mustard were excluded from foods to limit. The HPS was also updated to reflect EWCFG. For example, French fries, once considered a vegetable, are listed under foods to limit; while fats and oils, with the exception of butter, hard margarine, lard and shortening, are now listed as important elements of a healthy diet when consumed in moderation.

Two estimation tools were developed: one to predict whether a meal contains less than or greater than 30% of energy from fat, and another to determinant whether a food found in Canada's food groups contains a high amount of fat.

4.5.0 Fat Estimation

The original HPS evaluates fat intake based on whether the meal contains $\leq$ or $>$ 30% of energy as fat. In order to avoid the use of nutrient analysis software, Phase II developed a fat estimation tool using the following procedure. Twelve families from the Phase 1 data set were randomly selected. All food items on the 24 hour dietary recalls containing ≥ 1 gram of fat were inputted into an Excel spreadsheet, categorized by food group, and given a weight based on fat content (1 point=10g fat). The weight of each food item was compared to the fat content computed by the nutrient analysis program and cross-referenced to the fat content obtained from the Canadian Nutrient File 2007 (CNF) (112) and/or the nutrition label. This information was used to update the meal descriptions in reference to total energy, energy from fat, and grams of fat. A fat score for each meal was computed by adding the total weighted points scored for each food item in the meal that contains fat and a cut-off grade that best predicted which subset a meal belonged to (either $>30\%$ of kcal from fat or $\leq 30\%$ of kcal from fat) was computed. The accuracy of the method was assessed by comparing categorization based on the estimated fat score relative to the measured fat score. Foods that yielded false positive score, a false negative score, or that did not influence the categorization, were deleted from the tool. To simplify the tool all weights were round to reflect an easy to estimate serving size such as whole or half-metric measurements, or to descriptive measurements such as slice, or piece. The food items with serving sizes representing 1 point each, that best predict which subset a meal should be categorized into, were compiled in a table corresponding to: Fats and Oils and Limiting Foods, Meat and Alternatives, Milk and Alternatives, Grains Products, and Vegetables and Fruit.

4.5.1 Fat Estimation Results

The accuracy rate of the tool using the initial 12 families was assessed at 88% with a sensitivity of 82.5% and a specificity of 90.4%. To assess the reliability, the categorization method was applied to the remaining 13 families in the Phase 1 dataset yielding a sensitivity of 82.8% and specificity of 82.7% and an overall accuracy rate of 83% with a positive predictive value (PPV) of 78.7% and a negative predictive value (NPV) of 86.1%. A lower PPV as compared to NPV was expected due to the low prevalence of meals that contain $\leq 30\%$ of kcal from fat (n=58 or 43.6%).

4.6 High-Fat Estimation

Some foods that are part of EWCFG's food groups contain large amount of fat either as a natural component of the food item e.g. nuts, or secondary to preparation methods such as deep frying and/or by adding fats during cooking or at the table. The characteristic that differentiates limiting foods from foods found in the high-fat subcategory of EWCFG is the nutrient content relative to the fat content, also known as nutrient density. In order to simplify classifying a food item as high in fat, a set of questions based on the Health Canada thresholds was developed. To arrive at these screening questions, the percentage of energy from fat for the 1000 food items found in Health Canada's *Nutrient Value of Some Common Foods* booklet (113) were reviewed to ensure that Health Canada's thresholds for classifying foods as high in fat are described by at least one criterion. The screening criteria were:

1. Any food that is cooked using a high fat method
2. Any food that is prepared using added fat
3. Any food item prepared with a high-fat meat and/or alternative defined as containing $\geq 40\%$ kcal from fat

4. Any food item prepared with a high-fat milk and/or alternative defined as containing $\geq 40\%$ kcal from fat

The questions used to assess if a food item meets any of the criteria used to determine if a food item is high in fat were:

1. Is it cooked using a **high fat cooking method** such as deep-frying and/or pan-frying with fat?
2. Is it made using **added fat** such as mashed potatoes made with butter or margarine, and salads prepared with regular* salad dressings and/or mayonnaise
3. Is it made with **High-Fat Milk and/or Alternative** which includes:

Whole milk (liquid, evaporated & powder)

Regular* cheese, cheese spreads and powdered imitation cheese

Milk products with greater than 4% M.F (includes eggnog & some yogurts)**

4. Is it made with **High-Fat Meat and/or Alternatives** which includes:

Ground meats and poultry (except for lean ground)

Processed meats e.g. bacon, ham, sausages, luncheon meats, hotdogs (except low-fat versions**)

Meat without fat trimmed (including skin)

Canned meat and poultry, and fish canned in oil

Fatty cuts of meat which include:

All **dark cuts** of meat (except for turkey) and all **rib cuts** of meat

All pork except for center cut chops, tenderloin roast and lean ground pork

All beef except cuts from round and sirloin, and stewing beef, rump roast and lean ground beef

4.7 Data Collection

The research protocol was approved by the University Research Ethics Board (UREB) at Mount Saint Vincent University (MSVU) (Appendix B). The goal was to recruit 50 low-income, lone mother-led families living with dependent children between the ages of 2 and 14 in Nova Scotia. Participant characteristics were the same as those included in the Hungry Mothers Study with the added exception that a minimum age was set for the children. The minimum age was based on the recommendations made by EWCFG, which are only applicable for individuals over the age of two (25), while the maximum age was based on the limited control parents have over the food choices of teenagers (92, 114). Low income was defined as anyone on income assistance, employment insurance, who worked for minimum wage, or who had an annual income of less than or equal to \$25,000/year.

4.7.1 Participant Recruitment

Participants were recruited through gatekeepers and community organizations serving the target population using word of mouth, contact with key informants, and posters (Appendix C). Each organization and business was initially contacted via traditional mail or email. A two-page summary of the project, which included the inclusion criteria, purpose of the study, what was being asked of the organization, confidentiality precautions, locations of the interview, and compensation for participation was sent to each organization. After a period of one week, the researcher followed up with each organization via telephone to further discuss the project and to determine if the organization was interested in helping to recruit participants for the study. This process was repeated as new organizations and community contacts were developed. A total of 86 organizations were contacted and 33 agreed to participate in the study. A list of all the organizations and gatekeepers who helped advertise and who supported the project is provided in

Appendix D. All women who completed an interview were invited to ask other mothers in similar situations if they would participate in the study.

4.7.2 Organization Recruitment

A stratified sampling approach was used in the beginning stage of recruitment to ensure the representation of lone-mothers from Aboriginal, Black, and Acadian cultures and from the Northern, Southern, Eastern and Central regions of Nova Scotia. These seven strata were selected because each stratum represents a major culture group in Nova Scotia and because there are Family Resource Centres (FRC) that specifically service these communities. A list of all the FRC in Nova Scotia was compiled from Family Connections, an electronic directory of Nova Scotian FRC provided by the Department of Community Services and an electronic list provided by the Department of Education. A combination of both electronic lists was used to compile the final list of FRC for the sampling pool because neither list contained all of the FRC currently operating in Nova Scotia (Appendix E). To ensure each FRC was currently operating, the researcher contacted each FRC via telephone before it was placed into the final sampling pool. Using information obtained through Family Connections the FRC were categorized into seven strata based on the community in which they operate. The titles of the five original strata are Northern Region, Eastern Region, Western Region, Central Region and Diversity.

The Diversity Stratum contains FRC that are either located in communities where the majority of residence (>50%) are classified as visible minorities according to data from Nova Scotia Community Counts, or cultural or ethnic priorities were specified in the center's description found online. Following analyses, five FRC were classified into the Diversity Stratum: three FRC prioritized for Mi'kmaq/Aboriginal peoples, one FRC was located in a predominately Black community, and one FRC prioritized for Acadian Nova Scotians. To ensure representation of each culture, one of the three Aboriginal serving FRC was purposely

selected into the sample because it catered more to single mother families as compared to the other two FRC that focus on drug dependent individuals. The FRC serving the Black community and the FRC serving the Acadian community were also purposely selected. The remaining FRC were placed in one of the four regional strata. The Western Stratum, defined as FRC located in the area from Lunenburg to Kentville, contains 16 FRC. The Central Stratum, defined as FRC located in the Halifax Regional Municipality, contains 14 FRC. The Northern Stratum spans from Amherst to Canso and contains 6 FRC, and the Eastern Stratum contains the 6 FRC located throughout Cape Breton Island. Two centers from each geographical stratum were randomly selected by the principal researcher to be asked to participate in the study. If a centre refused to participate or was unable to find enough mothers another centre was randomly selected to participant in the study. Despite considerable effort, recruiting participants through FRC was not successful. As a result, recruitment was expanded to include food banks, childcare centers, women's centers, and career centers located throughout Nova Scotia. Recruitment took 18 months to complete.

4.7.3 Administering data collection tools

Each mother participated in one face-to-face interview which consisted of a record of the supper meal consumed by each family member to assess diet quality, and the administration of the Food Management Assessment questionnaire to determine the food management strategies used by each household. The children of the mothers participating in the study were allowed to be present (if necessary) to reduce participation barriers such as childcare. Information provided by the children was not recorded but mothers were allowed to change their responses to questions in light of information provided by their children. The gender, ethnicity, marital status, education level and household composition were obtained to classify the participants of the study and to ensure the participants met the inclusion criteria. Additional information voluntarily

provided by the participants was recorded in writing during the interview and, in some instances, from memory immediately after the interview. The same interviewer then transcribed the added information into a word document.

Diet quality was assessed using the HPS. The recall of the supper meal recorded the types of food, serving size, beverage consumption, cooking method, and servings from each food group onto a drawing of the supper meal plate. The interviewer showed the mother the pictorial description of the supper meal described to confirm accuracy of the serving sizes.

4.8.0 Safeguards: Ensuring Participants met Inclusion Criteria

Gatekeepers at the community level were asked to identify women with at least two children who were within the accepted age range of 2-14 years old and who would be considered low income, which was defined as anyone on income assistance, employment insurance, who worked for minimum wage, or who had an annual income of less than or equal to \$25,000/year (\$12/hour for full time work would be considered low-income). Each participant was also required to provide information on family composition including the number of individuals living within their household and the relationships amongst family membership (e.g. child, niece, mother, brother etc.). The last question on the survey was taken from Canadian Community Health Survey Cycle 1.1 to measure food security status. Although not all low-income mothers are food insecure, the majority of single mothers are (70).

4.8.1 Safeguards: Ensuring confidentiality

To ensure complete confidentiality of the information received during the interview the names of the participants were not recorded; instead, a number was given to each family, and a sub letter code was given to each member of the household (M-mother, A, B, C etc. –given for each child).

Participants were required by MSVU to fill out a receipt indicating that they received a \$10 honorarium for participating in the study. The receipt was stored in a separate envelope so that the interview notes could not be linked to the name on the receipt and all receipts were shredded after being sent to the Financial Services as proof of payment.

4.9 Data Analysis

The information provided during the interview was gathered onto the Healthy Plate Template (Appendix G) and the Food Management Questionnaire (appendix A) by the interviewer. The HPS for each meal described on the Healthy Plate Templates was scored using the fat estimation tool, the limited food item tool and the high-fat category tool after the interview was completed. The HPS and responses to the questionnaire were inputted into an SPSS spreadsheet (SPSS Inc. Version 16.0, Chicago, IL) for statistical analysis.

Cronbach's alpha was used to assess the internal consistency of the Food Management Assessment Tool. The original questionnaire consisted of five typologies with each typology being comprised of four to seven constructs measured with one to five questions. The Cronbach's alpha was performed to test whether each construct fit to the assigned typology. To do this, each construct that contained greater than one question, for each typology and for the tool as a whole was assessed and questions not meeting the thresholds were eliminated. All items with a corrected item-total correlation value less than 1 were immediately removed from each of the typologies. Questions were then removed and/or displaced among the typologies until an acceptable Cronbach's alpha value of between $\alpha = 0.6$ and 0.8 (115, 116) was achieved for each typology. An index score was developed to correspond to each of the remaining questions yielding a Family Score for each typology and a standardized overall Food Management Skills Score.

The HPSs were dichotomized as unhealthy (scores 0-3 (58.3%, n=28)) or healthy (scores 4-6 (41.7%, n=20)). A cut off score was established for each typology to enable categorization of families as either using the strategy or as not using the strategy i.e. families were considered either mother-driven or not mother-driven. To do this, each typology was divided in half based on distribution around the 50th percentile. If no difference was found between the top half and the bottom half of the distribution, then comparisons were made between both the top and bottom 25th percentiles. A finding of no significant difference between the top and/or bottom percentiles meant that the typology had no effect on family diet quality.

The associations between familial diet quality and food management strategies were assessed categorically with Pearson's Chi Squared test and the relationships were assessed quantitatively using Pearson's correlation. If Chi Squared tests indicated a significant relationship between the two categorical variables (e.g. good diet quality vs. poor diet quality and mother driven vs. not mother driven) then Pearson correlation was preformed to test whether HPS (interval) increased proportionately to an increase in each typology score (interval) and in the overall food management score.

Levene's test was preformed to test the homogeneity of variance assumption, and if proven to be true then the universality of the typologies was assessed by computing two-tailed mean comparison statistic (ANOVA, Tukey's test) for each descriptive group (# of family members, cultural background, education level, geographical region, and marital status) to ensure typology scores did not differ based on descriptive statistics. If the assumption of homogeneity of variance was violated the Brown-Forsythe F-ratio was reported.

5. RESULTS

5.0 Participants

Forty-eight (48) families from across Nova Scotia participated in the study: the two largest recruitment locations were from the eastern (56%) and the central (32%) regions of the province. There was an even distribution between male (50%) and female children (50%). The majority of the lone-mothers who participated in the study had graduated high school or received their General Equivalency Diploma (GED) (75%). Of those who completed high school, 19.4% completed trade or vocational school, and 33.3% completed university or college. We were successful in getting participant from the three cultures outlined in the Diversity Strata. Two immigrants also participated in the study, which was a stratum that was overlooked during the planning phased of the project. The descriptive statistics are described in Table 2.

Table Participant Descriptions

Independent Variable	n	%
Geographical Region		
Central	16	32.0
Eastern	28	56.0
Northern	1	2.0
Western	5	10.0
Education		
Less than Grade 12	12	25.0
High School Graduate or GED	17	35.4
Vocational School or Trade	7	14.6
University or College	12	25.0
Ethnicity¹		
African Canadian	3	6.1
English	34	69.4
First Nation	6	12.2
French Canadian	4	8.2
Immigrant	1	2.0
Other	1	2.0
Marital Status		
Single	32	66.7
Divorced	11	22.9
Common law	4	8.3
Widow	1	2.1
Separated	1	2.1

Number of Family Members		
Three	23	47.9
Four	13	27.1
Five	9	18.8
Six to Eight	3	6.2
[†] Some participants indicated multiple ethnicities.		

5.1 Diet Related Medical Conditions

Mother's were asked if they or their children add a nutrition-related medical condition defined as a condition that requires a special diet (Table 3). Although most participant (72%) did not have a nutrition related medical condition, the majority of family systems (64.6%) were influenced by having at least one member of the family requiring a special diet. Approximately one-third of families had a child member who required a special diet and 25% had more than one family member with a nutrition-related condition. The most common diets were breast- or bottle feeding (18.8%), diabetes mellitus (10.4%), heart disease (10.4%), and food allergies (8.3%) including one member with Celiac disease. Some families (12.5%) were currently prescribed a diet to help treat/manage psychological illnesses. Two mothers had both diabetes and hypertension but neither followed a diabetic or a heart healthy diet because they felt they could not afford to do so. Another mother, who suffered from celiac disease, anemia, and high cholesterol, testified that she could not afford to follow her prescribed diet; which meant that she was currently consuming gluten and skipping meals. One mother, who was currently on disability due to a heart condition, said that because of her heart condition she does not have the energy to argue with her children to eat healthy and because of their current financial situation they regularly consume processed food because she had access to free meals from a fast food establishment where a family member was employed.

Table Nutrition Related Medical Conditions Reported by the Mothers

Nutrition Related Condition	n-Family	n-Individual
Mother Breastfeeding	5	5
Child Bottle Feeding	4	5
Food Allergies	3	5
Celiac Disease	1	1
Diabetes Mellitus	5	5
Other	23	34
Mental Illness: ADHD, Asperger, Tourette Syndrome & OCD	6	7
Heart Disease	5	5
Bowl Disease: IBS/Crohn's	4	4
Anemia	2	2
Gastric Bypass Surgery	2	2
GERD	1	4
Fibromyalgia	1	1
Gallbladder Removed	1	1
Hiatal Hernia & Gastritis	1	1
Liver Disease	1	1
Premature Child*	1	1
Weight loss	1	1
Not Specified	1	1
Total With	31	47
Total Without	17	131

5.2 Diet Quality

Diet quality (HPS) was scored for each family member (n=161) and for each family (n=48). Thirteen supper meals could not be scored because the individual was either exclusively breast- or bottle-fed (n= 5), away from home (n=4) or outside the age requirements i.e. adult children living at home (n=4). Two families had <3 individual HPS included in their family average score. On average, both individual and familial diet quality was poor based on a rounded $HPS \leq 3$.

The family HPS averages were comparable to individual HPS for measures of central tendency, variability and shape as shown in Figures 3 and 5. The correlation between the family

and individual scores was 0.781 ($p < .01$), which means that the family score accounted for about 61% of the variability in the individual scores ($r^2 = .610$). Therefore, familial level analysis of diet quality was able to measure intra-familial variability in diet quality.

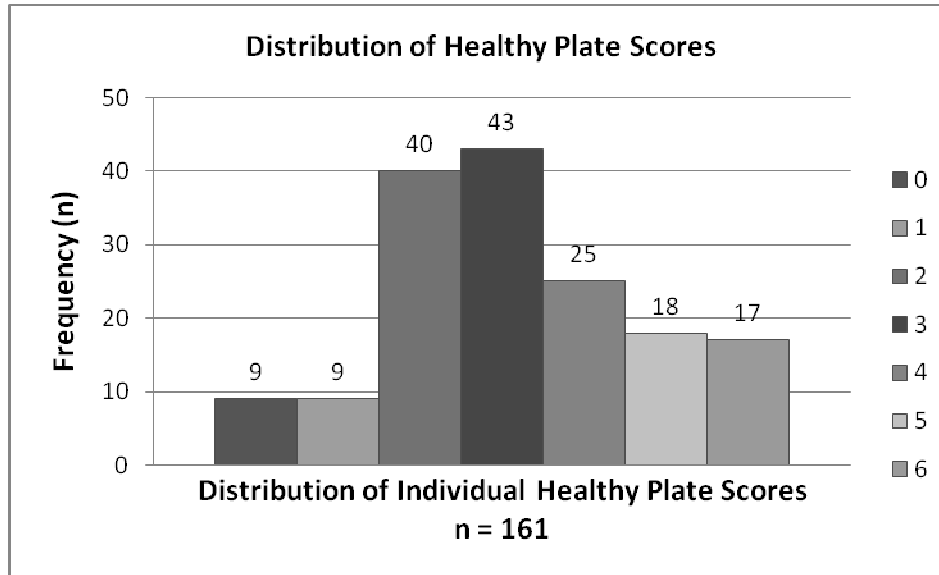


Figure . Distribution of Healthy Plate Scores in the sample population.

Each family member scored as separate entity, "0" indicates lowest diet quality and "6" indicates highest diet quality; mean=3.17, s.d. = 1.59, normal distribution: zskewness (i) =.484, zkurtosis (i) =-.1.37

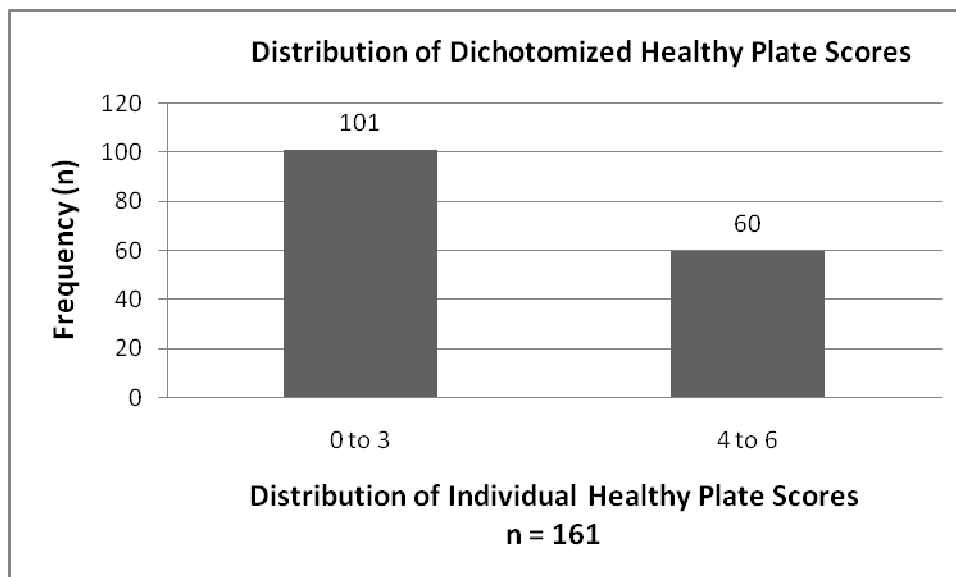


Figure . Distribution of dichotomized Healthy Plate Scores.

Each family member scored as separate entity, scores "0-3" classified as poor diet quality and scores "4-6" classified as good diet quality.

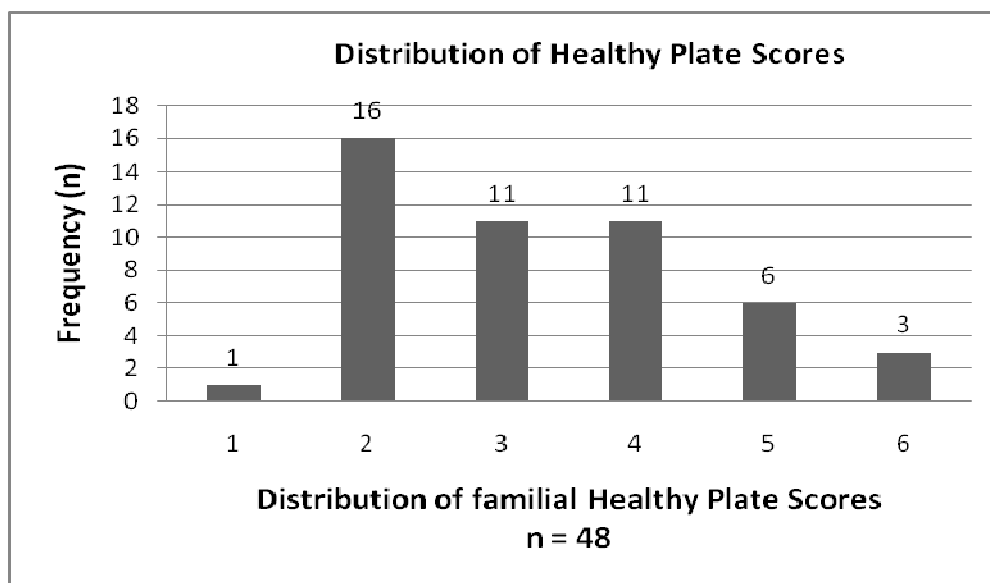


Figure . Distribution of Healthy Plate Scores in the sample population.

Familial scores based on average of individual scores, "0" indicates lowest diet quality and "6" indicates highest diet quality; mean=3.25, s.d. =1.3, normal distribution: zskewness (f) =1.41; zkurtosis (f) =.998

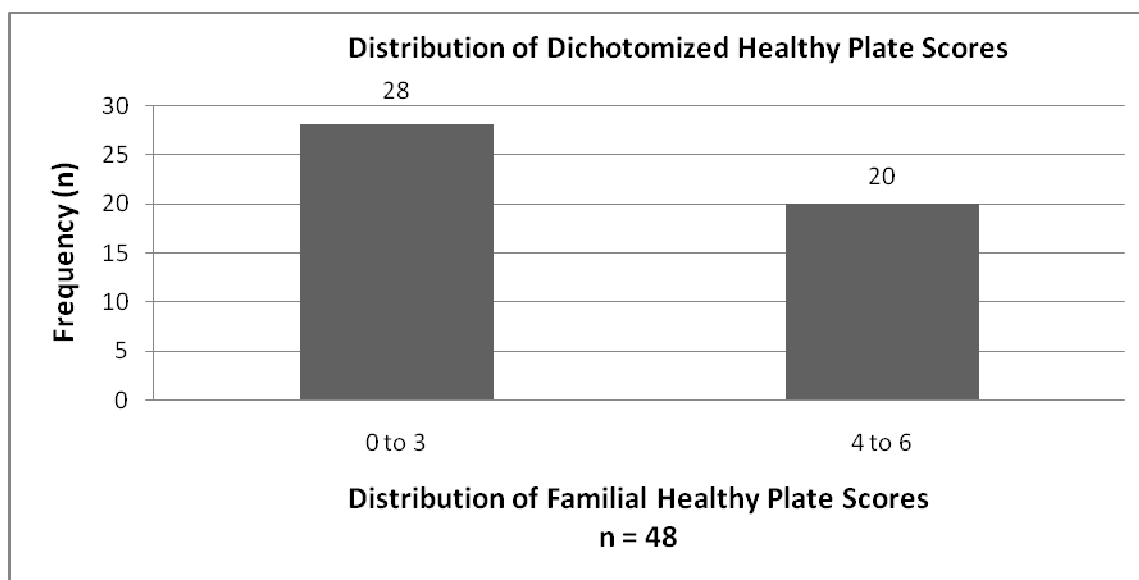


Figure . Distribution of dichotomized Healthy Plate Scores.

Familial scores based on average individual score, scores "0-3" classified as poor diet quality and scores "4-6" classified as good diet quality.

5.3 Intrafamilial Diet Quality

Family members were categorized based on family position as, 1) the mother, 2) the oldest child, or 3) the youngest child. Family position had a significant effect on diet quality ($p = .05$); the mothers', oldest and youngest children's HPS means were 2.71, 3.33 and 3.63,

respectively. In the more conservative post hoc test, the mothers' diet quality was significantly less than the youngest child's diet quality ($p < .05$) while diet quality of the oldest child was not different from the mother ($p = .147$ ns) nor from the youngest child's ($p = .664$ ns). On average, maternal diet quality was poor ($HPS \leq 3$) while the youngest member's diet quality was good ($HPS \geq 4$).

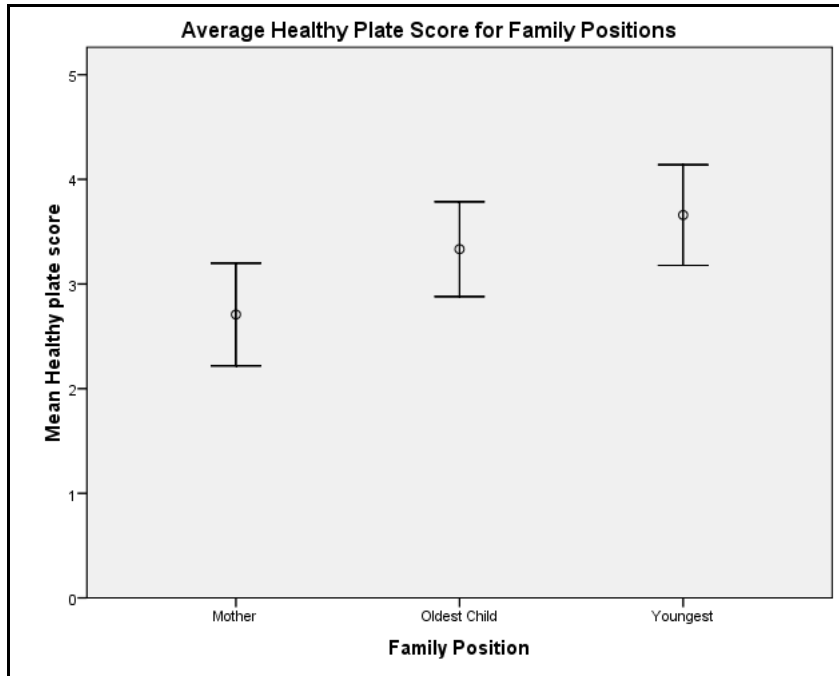


Figure Average Healthy Plate Scores based on family position.

ANOVA tests indicated a significant difference between the three groups, $f(2, 135) = 3.965, p = .05$; Tukey's tests found that the Mother's Healthy Plate Scores were significantly less than the youngest child's Healthy Plate Score ($M = -.920, SE = .336, p < .05$).

5.4 Regional Diet Quality

Individuals were categorized based on the geographical region in which they live and HPS means were compared for the Eastern ($n=95$), Central ($n=47$) and Western ($n=16$) regions of Nova Scotia (Northern region could not be assessed because there were too few cases ($n=3$)). Individual HPS varied among the 3 regions of the province, $f(2, 158) = 4.971, p < 0.01$; HPS were significantly higher in the Western Region as compared to the Eastern Region, $M = 1.196$,

SE = .421, $p < 0.05$. However, on a family scale, HPS did not significantly differ based on geographical region, $f(2, 44) = 2.381$, $p = .104$ ns, as shown in table 4.

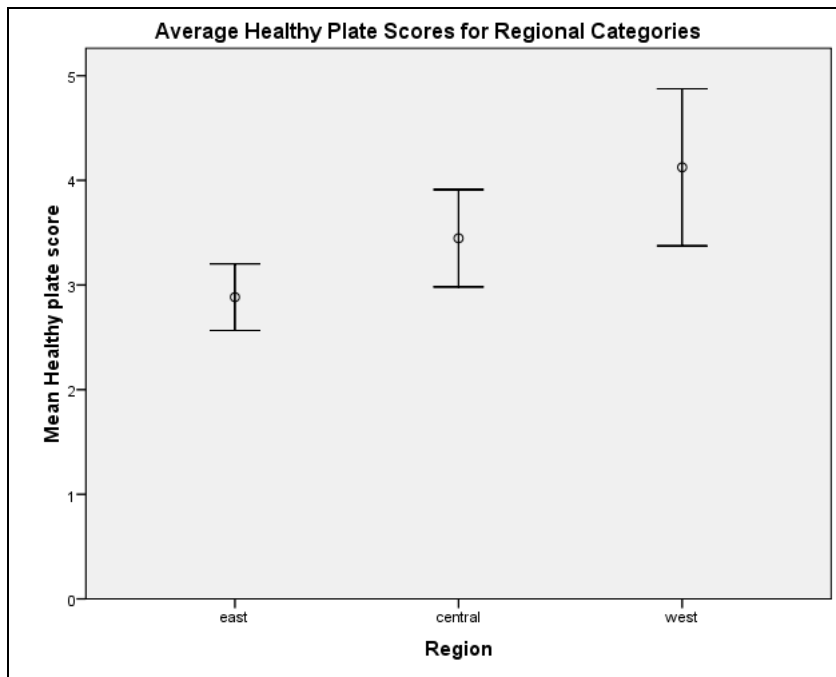


Figure Average healthy plate scores for regional categories (n=158).

Table Average Family Healthy Plate Score for Regional Categories

Region	N	Mean HPS	Compared Region	Mean Difference	Significance	95% confidence interval
Eastern	28	3	Western	-1.2	.135 ns	-2.69 to .29
Central	14	3.57	Eastern	.571	.359 ns	-.43 to -1.57
Western	5	4.20	Central	.629	.609 ns	-.97 to 2.23
Significance		1.20 ns				

5.5 Socio-demographic Predictors of Diet Quality

The mother's education level and cultural background was not independently associated with individual or familial diet quality. There was no significant differences in individual diet quality among the four educational groups, $f(3, 160) = 1.286$, $p = .281$. There were too few cases in some cultural groups to compare all of the cultural backgrounds represented, but there was no

significant difference on family or individual HPS among African, English speaking, First Nations or French cultures, $f(3, 39) = .979, p = .412$; $f(3, 147) = .952, p = .417$.

5.6 Fussy Eaters

The majority of the mothers (81.2%; $n = 39$) reported that they consider at least one of their children to be a fussy eater. Surprisingly, the oldest child in the household was more likely to be a fussy eater (46.9%) than the youngest member of the household (29.2%). Furthermore, having a mother who considers herself to be a fussy eater was not shown to influence the likelihood that her children would be fussy eaters, $r = .246, p = .091$ ns. In total, 40% ($n=50$) of the children were considered fussy eaters. Being a fussy eater can decrease the variety of one's diet as our research shows that 36% of those who are fussy eaters eat the same foods day after day and 64% consume diets consisting of very few foods. Having a fussy eater within the home can be more expensive than not having a fussy eater within the home and it can be more time consuming to feed a fussy eater, as over half the mothers interviewed (54%) reported making special meals for the fussy members of the household. Furthermore, a significant difference was found between the HPS of fussy children vs. non fussy children, $f(1, 114) = 7.732, p < .01$; as an independent variable, fussy eating could explain 7% of the variation in the children's HPS, $r = .263, p < .01$.

5.7 Effecting Change

A majority of the mothers (52%) said they would like to change their family's food choices; and of those mothers who wanted change, 84% said they were currently trying to make the changes. The mothers were asked an open-ended follow up question which inquired about factors that would make the change process easier. Answers varied but three major themes arose: reduce financial barriers (80%); improve the mother's food skills (36%); and reduce the fussiness of the children (36%). One mother wished her children could try food before she

bought it and another wished she could introduce new foods slowly into her children's diet; a strategy recognized by dietitians as being an effective way to introduce new foods to children (137). In addition, another mother believed healthy influences from her children's friends would help change her family's food choices.

5.8.0 Reliability Test

Once the questionnaire was developed a key aspect of assessing its usefulness was to assess the internal reliability. Each typology was modified in response to yield the final series of questions to be used in the tool. The process and final tool is depicted in Figure 9.

5.8.1 Mother Driven Typology

The mother-driven typology achieved an internal consistency of $\alpha = 0.698$. Four of the five constructs were worthy of retention while 10 questions were removed from the typology. The constructs retained measure child centered rationales for food choices including picky eaters, whether food choices are based on the mother's preferences, and the level of control the mother has over the home. The deleted construct attempted to assess whether mothers cook for their children. The deleted questions in this typology asked about the influence of peer pressure on food choices, the degree to which the mother's likes and dislikes influence the food choices made within the home, and four of the five questions related to control.

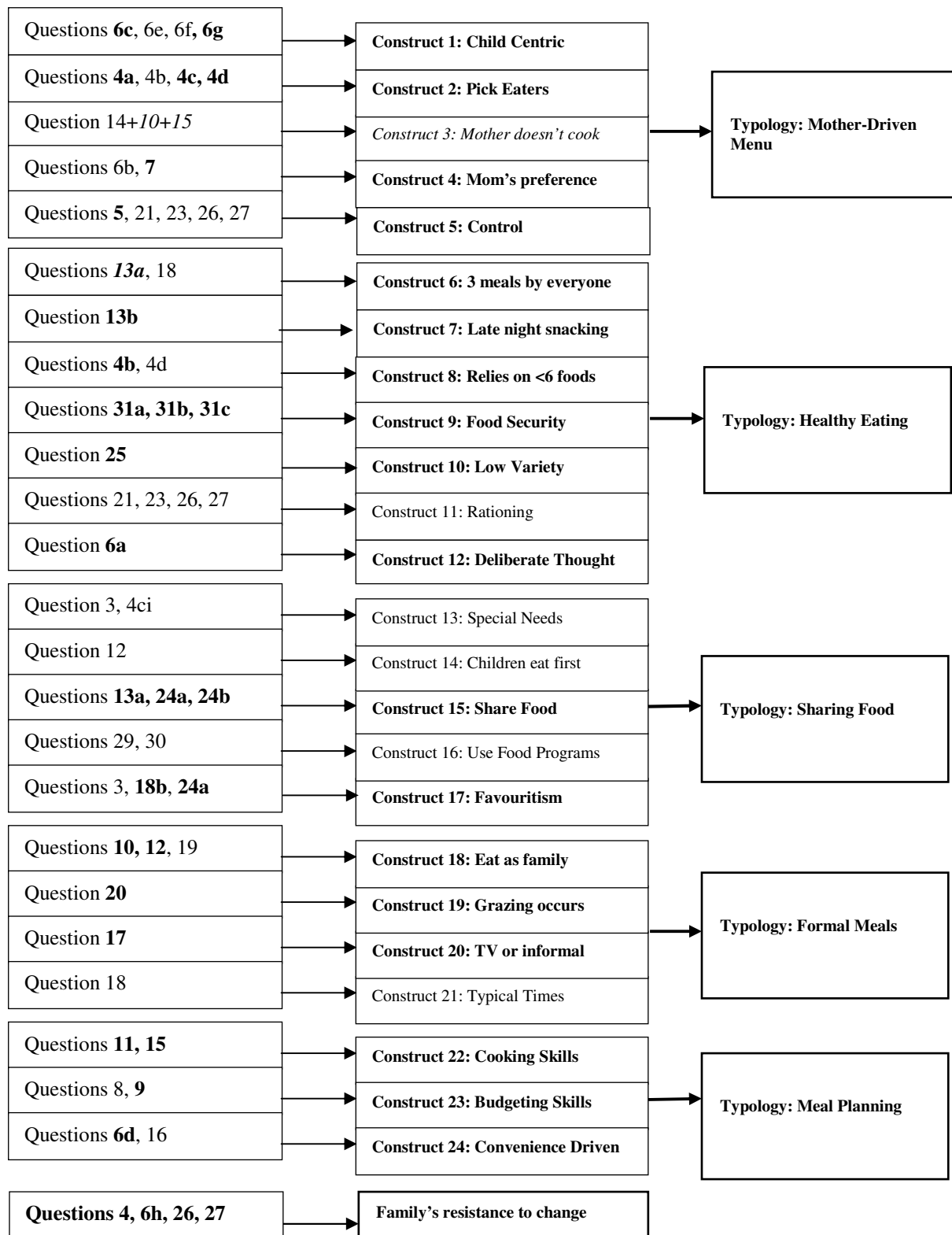


Figure Model of reliability test used on food management assessment questionnaire. Bold items remained in questionnaire after analysis; italicized items were moved to another construct.

5.8.1.1 Child centered (construct 1)

The child centered subscale fell slightly short of having good internal consistency with $\alpha = 0.577$. However, when scored using a Likert scale, Cronbach's alpha increased to $\alpha = 0.640$. The four questions focused on child-centric rationales for choosing foods including whether a child's likes and dislikes influenced the food choices made by the entire family, and whether pressure from the school, children's peers or television had an influence over the foods found within the home.

5.8.1.2 Picky eaters (construct 2)

Internal consistency for the four questions pertaining to fussy or picky eaters was $\alpha = 0.918$ for each child in the family when assessed from oldest to youngest. The α score for the fifth child was 0 largely because of lack of variability in the responses. Further analyzes was conducted to determine if the question could be simplified by asking if "any of the children" are considered to be fussy eaters rather than asking about each child individually. The four questions continued to be reliable in measuring fussiness when asked in the more generalized format ($\alpha = 0.742$). These findings verify that the questions do in fact measure the fussiness of a child in relation to food.

5.8.1.3 Mother does not cook (construct 3)

The two questions chosen to identify families led by mothers who do not cook (#10, 14) did not achieve a significant internal reliability ($\alpha = 0.142$) and both were deleted from the typology.

5.8.1.4 Food choices based on mother's preferences (construct 4)

The two questions chosen to measure the degree to which the mother's food preferences influence the foods consumed by the family (#7, 10) did not achieve significant internal reliability ($\alpha = 0.233$).

5.8.1.5 Control (construct 5)

Five questions were included on the questionnaire to measure the degree to which the mother controls the household. These questions explored food rationing methods such as hiding food and controlling the serving size and frequency in which the children consume both snack and healthy foods; whether the mother sees a need to change the families food choices and if she has been trying to make changes within her home; and if the mother believes that her children would listen to her if she tried to change or control the foods that they eat. Question 5, which asked if the mother felt that each of her children would listen to her, was retained but the other questions pertaining to controlling foods were deleted because they seemed to measured food rationing skills rather than control.

5.8.2.0 Healthy Eating Typology

The healthy eating typology had good internal consistency ($\alpha = 0.758$). The questions within the typology explored whether everyone in the household consumed at least three meals a day; if late night snacking occurs; if there is little variety in the family's diet; if deliberate thought is given to eating healthy; and the degree of food security experienced by the family. The rationing food construct was eliminated from the typology, which increase alpha by .09.

5.8.2.1 Three meals eaten by everyone in the household (construct 6)

The number of meals and snacks consumed by the children of the household did not have good internal consistency with whether the mother ate at least three meals per day ($\alpha = 0.193$). The question pertaining to the number of meals and snacks children consumed (# 18) had zero variance as all mothers reported that each of their children consumed at least three meals and snacks per day; therefore, it was deleted from the tool. The question pertaining to the mother was retained.

5.8.2.2 Low variety (construct 8 and 10)

Three questions were asked to measure variety in the diet. The two questions about the children's eating habits achieved internal consistency level of $\alpha = 0.563$ when asked in the generalized format regarding all of the children. Interestingly, the questions which asked if the mother felt that her family ate the same foods day after day was not shown to have good internal consistency with the two variety questions that asked about each individual child ($\alpha = 0.390$), but was shown to fit well within the healthy eating typology ($\alpha = 0.778$).

5.8.2.3 Food security (construct 9)

The three questions pertaining to food security status were reliable ($\alpha = 0.652$).

5.8.2.4 Food rationing (construct 11)

The food rationing construct has an $\alpha = 0.720$. Despite having good internal consistency the construct did not fit within the typology and was therefore deleted.

5.8.3.0 Food Sharing Typology

The Food Sharing Typology was reduced to two constructs (mother consumes same amount of food as children and family members are not inappropriately favored in relation to food access) in order to achieve an acceptable internal consistency level of $\alpha = 0.609$. The Food Sharing Typology did not have good internal consistency ($\alpha = 0.150$) when all five of the constructs were included in the analyzes: family members have special dietary needs; children eat first; healthy foods are shared; food programs other than those available at the family resource centre are used; and family members are favored over the other members of the family.

5.8.4.0 Formal Meal Typology

The formal meal typology explores whether family members eat together, if grazing occurs within the household, if the family watches television while they eat supper and if the mother used at least four healthy cooking methods within the past week. This typology achieved

a satisfactory reliability score ($\alpha = 0.606$). The construct relating to the typical times at which meals are consumed was deleted from the tool.

5.8.4.1 Family members eat together (construct 18)

The three questions that explored whether family members regularly eat together achieved good internal consistency ($\alpha = 0.682$), which was improved to $\alpha = 0.816$ after deleting question 19 which asked if the family eats together: everyday, most days, occasionally, finds it difficult, or never.

5.8.5.0 Meal Planning Typology

The meal planning typology did not have an acceptable internal consistence level when comprised of the three initial constructs ($\alpha = 0.484$): healthy cooking skills are demonstrated, budgeting skills are used, and the family is not convenience driven. It seems that there are different aspects of meal planning; one focus is on meal planning and the other is on budgeting.

5.8.5.1 Cooking methods (construct 22)

Self-rated cooking skills and cooking methods used in the past week can reliably measure cooking skills ($\alpha = 0.554$).

5.8.5.2 Budgeting skills (construct 23)

Oddly, using coupons and/or flyers and using a shopping list while grocery shopping were not a reliable measure of budgeting skills ($\alpha = -0.173$). The question that asked the mother if she usually brought a grocery list while shopping was deleted from the tool because it showed the least amount of variation in responses.

5.8.5.3 Convenience driven (construct 24)

The questions chosen to measure the degree to which the family is driven by convenience were not reliable ($\alpha = 0.109$). Nonetheless, the question asking if the mother felt that convenience influences the food choices made by her family fit into the typology.

5.8.6 Family's Resistance to Change

The four questions added to the questionnaire to determine a family's resistance to change achieved good internal consistency ($\alpha = 0.631$). The questions asked if the mother is a fussy eater, if the mother's food habits have changed since she was a teenager, whether or not the mother wants to change her family's food choices, and if she is currently trying to do so.

5.8.7 Overall Tool

The Food Management Assessment Tool achieved an overall reliability score of $\alpha = .598$, which is less than the target level of between $\alpha = 0.6$ and 0.8 . However, Loewenthal (117) and Field (116) argue that this is acceptable given the diverse nature of the typologies within the tool, and the small number of typologies being measured ($n=4$). In addition, the corrected item-total correlation for each item is strong ($>.29$), which is an indicator of good internal consistency (116). The final tool included the Mother Driven Typology, the Healthy Eating Typology, the Formal Meals Typology and the Meal Planning Typology. The Food Sharing Typology was deleted because it did not relate to familial or individual diet quality.

Table . Reliability Test Outcomes

Reliability Test Outcomes
Mother Driven Household – Cronbach's $\alpha=.698$
Are any of your children fussy eaters? ...Because special meals must be made for them? ...Because there are very few foods that they will eat? Do you think all of your children would listen to you if you tried to control or change the foods that they eat? You feel your child's like and dislikes influence the food choice made by your family? You think ads on TV influence the food choices made by your family? Who do you feel has the most influence over the foods found in your home?
Healthy Eating Household – Cronbach's $\alpha=.758$
Do you consider your children to be a fussy/picky eater(s) because they eat the same foods days after day? You feel the healthfulness of food influences the food choices made by your family? Used "Does the mother consume three meals a day?" to measure whether "everyone in the family eats three meals a day?" Does the mother snack late at night? Do you feel your family eats the same foods day after day? In the past month, how often did you or anyone else in your household... ... Worry that there would not be enough to eat because of lack of money? ... Not have enough food to eat because of lack of money? ... Not eat the quality or variety of foods that wanted to eat because of a lack of money?
Food Sharing Household – Cronbach's $\alpha=.609$
Used "Does the mother eat 3 meals a day?" to measure whether "the mother sacrificed dietary intake for her

children” Do the children consume more snacks and meals then the mother? Do you restrict some foods for particular members of your family? Why do you save certain foods for them?
Formal Meal Structure – Cronbach’s alpha=.606
Do you eat supper with your children? Do you usually eat before, after or at the same time as your children? Does your family usually watch TV while they eat supper? Which one of these eating styles described you the best: meals only, snacks and meals, or grazing? Used “cooking methods used” to measure “has the mother used <4 healthy cooking methods in the past week?”
Meal Planning Typology – Cronbach’s alpha=.484
Do you usually use coupons or look at fliers? On a scale from 0 to 10, with zero indicating that you do not know how to cook, 5 indicating average cooking skills and 10 indicating expert skills, how would you rate your cooking skills? Do you feel that convenience influences the food choices made by your family? Used “cooking methods used” to measure if “mother demonstrates the use of healthy cooking methods and the avoidance of unhealthy cooking methods?”
Family’s Resistance to Change – Cronbach’s alpha=.631
Is the mother a fussy eater? Your food likes and dislikes have not changed very much since you were a teenager. Would you like to change you family’s food choices? Have you been trying to make these changes?
Removed Questions
Do you make special meals for them because of a medical reason such as allergies, celiac disease, diabetes etc? If children have special needs: Do you have special dietary needs? Such as.... Pregnant; Diabetes; Breastfeeding; Allergies; Celiac Disease; Other. Your likes and dislikes do not influence the foods choices made by your family. You feel pressure from your child’s school to change the foods that you give to your family. You feel that peer pressure from your child’s friends influences the foods choices made by your family. Do you usually bring a shopping list while grocery shopping for your family? Who usually prepares these meals? How many times a week does your family typically eat a homemade meal? Do you and your family eat together as a family? How many meals/snacks does each of your children typically eat throughout the day? Do you hide or lock up certain foods in your house? Do you typically hide foods from the four food groups or do you hide “other” foods? Do you use any of these methods to control the foods that are eaten in your house (excluding snack foods)? ... Decrease the serving sizes of particular foods ... Decrease the frequency certain food is served Do you use any of these methods to control the snack foods that are eaten in your house? ... Decrease the serving sizes of particular foods ... Decrease the frequency certain food is served What would make it easier for you to make these changes? Does anyone in your family have access to food programs other then those available through the family resource center? Examples of food programs would be a breakfast or milk program at school.

5.9 Effect of Predictor Variables on Food Management Score

None of the descriptive groups (region, education, marital status, culture and number of family members) were found to significantly affect the component typology scores or overall Food Management Score (FMS) as shown in Table 6.

Table Group mean comparisons based on descriptive statistics

Group	ANOVA (*or Brown-Forsythe F-ratio)
# of Family members ¹	T1: $f(3, 44) = .309, p = .819$ T2: $f(3, 44) = .574, p = .635$ T3: $f(3, 44) = .013, p = .998$ T4: $f(3, 44) = .472, p = .703$ FMS: $f(3, 44) = .126, p = .944$
Cultural Background ²	T1: $f(3, 39) = .371, p = .774$ T2: $f(3, 39) = 2.273, p = .095$ T3: $f(3, 39) = .489, p = .692$ T4: $f(3, 39) = .489, p = .692$ FMS: $f(3, 39) = .758, p = .525$
Education Level	T1: $f(3, 44) = .791, p = .506$ T3: $f(3, 44) = .720, p = .545$ T4: $f(3, 44) = .798, p = .502$ FMS: $f(3, 44) = .741, p = .533$
Geographical Region ³	T1: $f(2, 44) = .479, p = .699$ T2: $f(2, 44) = 2.238, p = .138^*$ T3: $f(2, 44) = 2.174, p = .126$ T4: $f(2, 44) = .653, p = .525$ FMS: $F(2, 44) = 1.121, p = .335$
Marital Status ⁴	T1: $f(2, 45) = .653, p = .525$ T2: $f(2, 45) = 2.032, p = .143$ T3: $f(2, 45) = .140, p = .870$ T4: $f(2, 45) = .062, p = .940$ FMS: $f(2, 45) = .252, p = .778$
¹ Families with ≥ 6 people were grouped together. ² Only African Canadian, English speaking, First Nation, and French cultures were compared because the other cultural groups had too few participants. ³ Excludes Northern region due to too few participants. ⁴ Separated group was combined with divorced group.	

5.10 Distribution of Family Typologies and Overall Food Management Score

The four family typology scores and the overall food management scores varied across families.

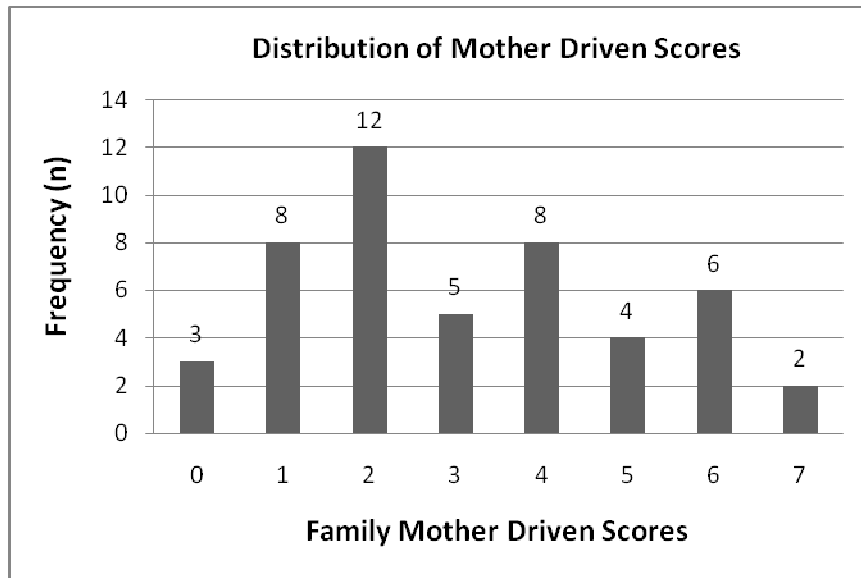


Figure . Distribution of mother driven families in the sample population

Mean =3.1 (44%).
(116)



Figure . Distribution of healthy eating families in the sample population.

Mean score=9.88 (62%) and the 50th percentile cut off point=11 (69%).

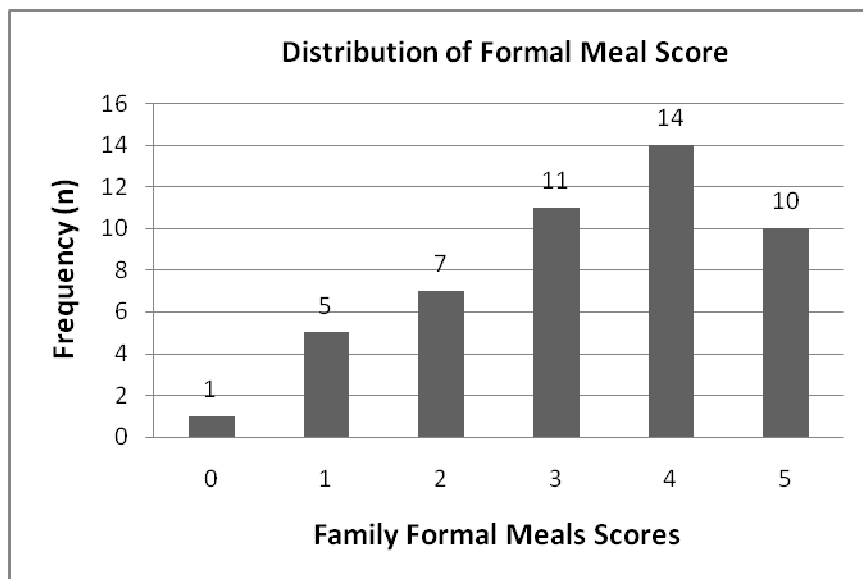


Figure . Distribution of formal meal structured families in the sample population.

Mean score=3.25 (65%), the bottom 25th percentile scored ≤ 2 (40%), and the top 25th percentile scored ≥ 4 (80%).

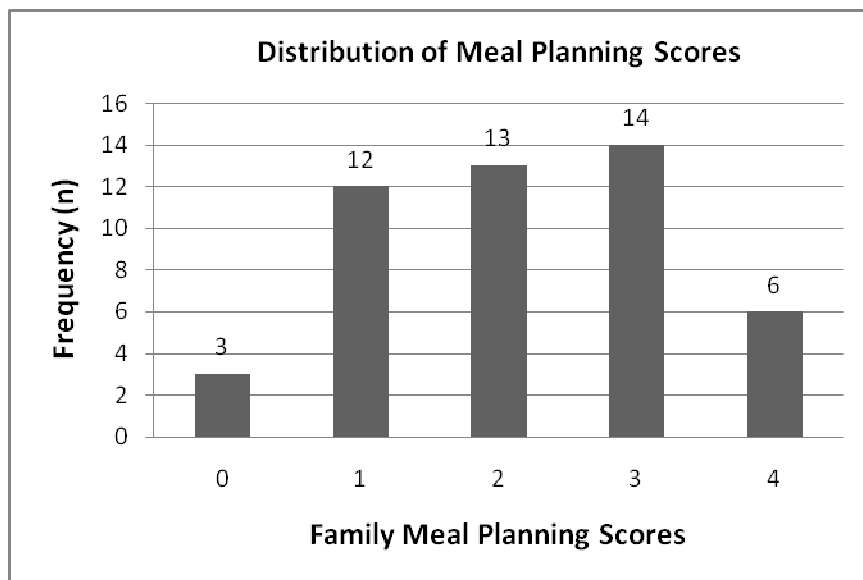


Figure . Distribution of meal planning families in the sample population.

Mean score=2.17 (54%).

Weighted scores were summed for each typology to obtain an overall FMS. The potential score range for the overall FMS was between 32 and 0; in comparison, the highest actual score was 29.26 (91%) and the lowest actual score was 6.03 (19%).

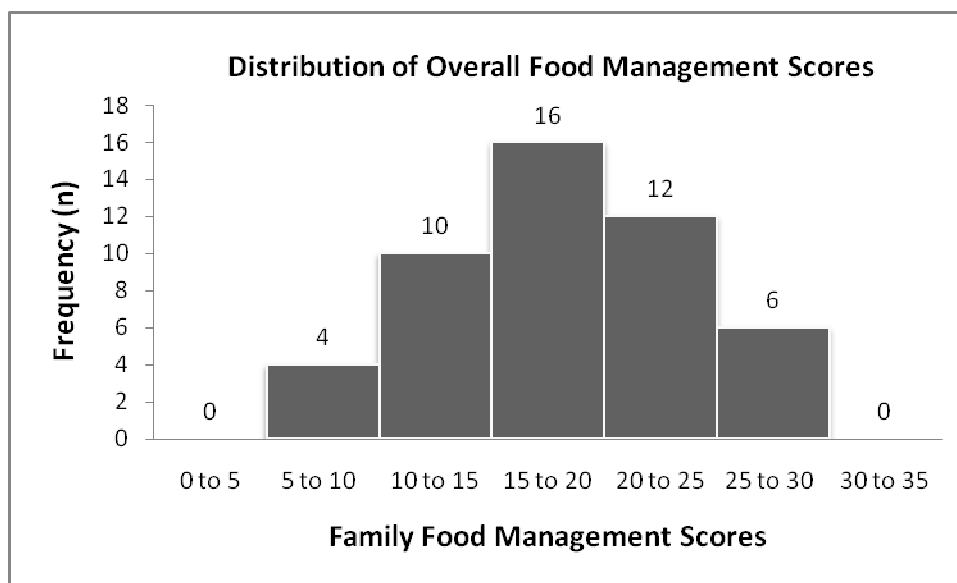


Figure . Distribution of food management scores in the sample population.

Based on standardized sum of the four typology scores; mean score=18.08 (56%), the top 25th percentile scored ≥ 22.93 (72%) and the bottom 25th percentile scored ≤ 14.61 (46%).

5.11 Relationship of Familial Diet Quality to Typology Scores

In order to assess the relationship between familial diet quality and the typology scores, it was necessary to construct dichotomous variables using percentile cut-offs, either the 50th percentile, or the 25th percentile. The mother-driven, healthy eating and meal planning typologies were divided at the 50th percentile; to find a significant relationship with familial diet quality, the formal meal typology was divided at the bottom 25th percentile and, to increase the strength of the relationship, the overall food management score was divided at the top 25th percentile. As shown in Table 7, the typology scores and the overall food management scores were normally distributed.

Table . Distribution of Typology Scores and Overall Food Management Scores

<i>Typology</i>	<i>Range</i>	<i>Mean</i>	<i>Distribution</i>	<i>Dichotomy Cut-off</i>
Mother Driven	0-7	3.1 (44%)	Normal:	50 th percentile:
			zskewness= 1.003	MDS = 3 (43%)
			zkurtosis= -1.362	

Healthy Eating	2-16	9.88 (62%)	Normal: zskewness = -1.35 zkurtosis=-1.12	50 th percentile: HES = 11 (69%)
Formal Meal	0-5	3.25 (65%)	Normal: zskewness = -1.475 zkurtosis = -.847	Bottom 25 th percentile: FMS = 2 (40%)
Meal Planning	0-4	2.17 (54%)	Normal: zskewness = -0.20 zkurtosis = -1.24	50 th percentile: MPS = 2 (50%)
Overall FMS	0-32	18 (56%)	Normal: zskewness = -1.475 zkurtosis = -.847 No outliers: >5% z- score >1.96 and 0 z- score >2.58	Top 25 th percentile: ≥22.93 (72%)

5.12 Relationship between Familial Diet Quality and Food Management Strategies

The mother driven, healthy eating, formal meal and meal planning typologies had an association with diet quality. The food sharing typology was not associated with diet quality and therefore had to be removed from the food management tool to follow method protocols written in the thesis proposal. The food sharing typology was unique in the fact that it required an association with diet quality (either familial or individual based on family position) because the purpose of this particular typology was to measure food allocation methods that influence intrafamilial diet quality.

5.12.1 Mother Driven Typology

There was a significant association between whether or not the house was mother driven and the diet quality (HPS) level $\chi^2(1) = 7.68, p < .01$. The majority of the families (75%) that were not mother-driven had poor diet quality ($HPS \leq 3$) while those that were mother-driven (65%) were more likely to have good diet quality ($HPS \geq 4$). Based on the odds ratio, families are 5.58 times more likely to have a good diet quality if they are mother driven.

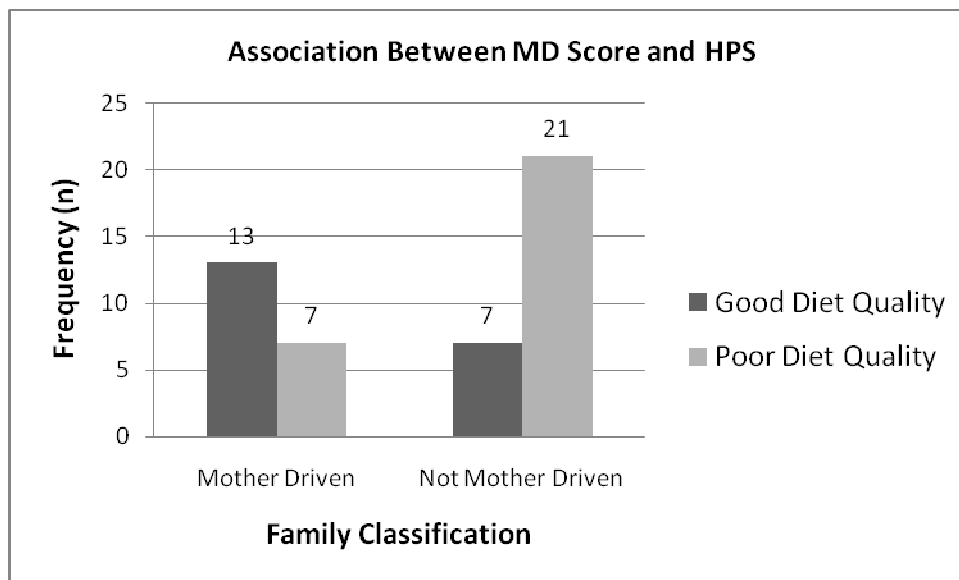


Figure . Association between dichotomized mother driven scores and healthy plate scores.

5.12.2 Healthy Eating Typology

Diet quality was impacted by whether a family was healthy eating driven $\chi^2(1)=5.073, p=.05$. Based on the odds ratio, healthy eating focused families were almost 4 times (3.91) more likely to eat a healthy diet than families that are not health driven.

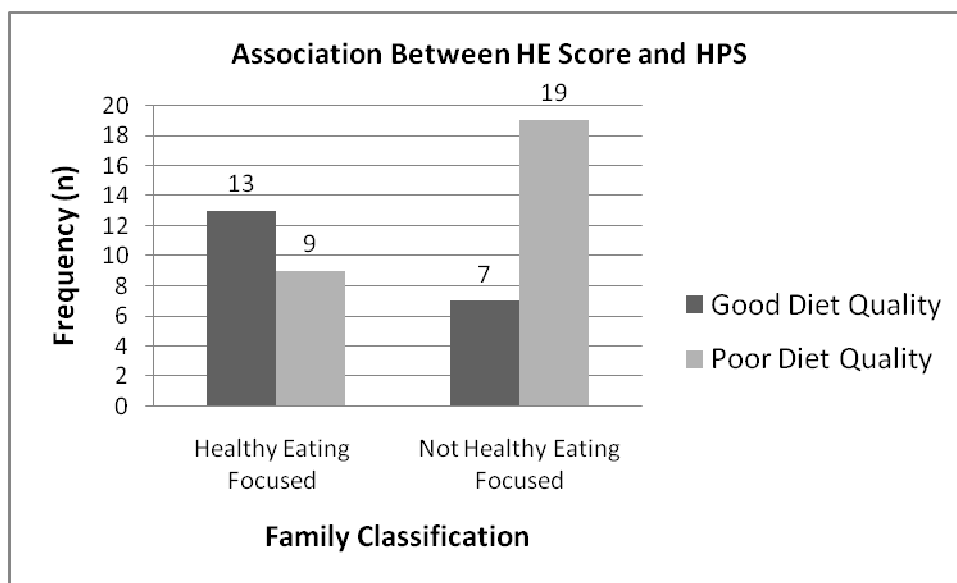


Figure . Association between dichotomized healthy eating score and healthy plate score.

5.12.3 Food Sharing Typology

The food sharing typology was not associated with diet quality (Pearson chi-squared=.288 (ns)).

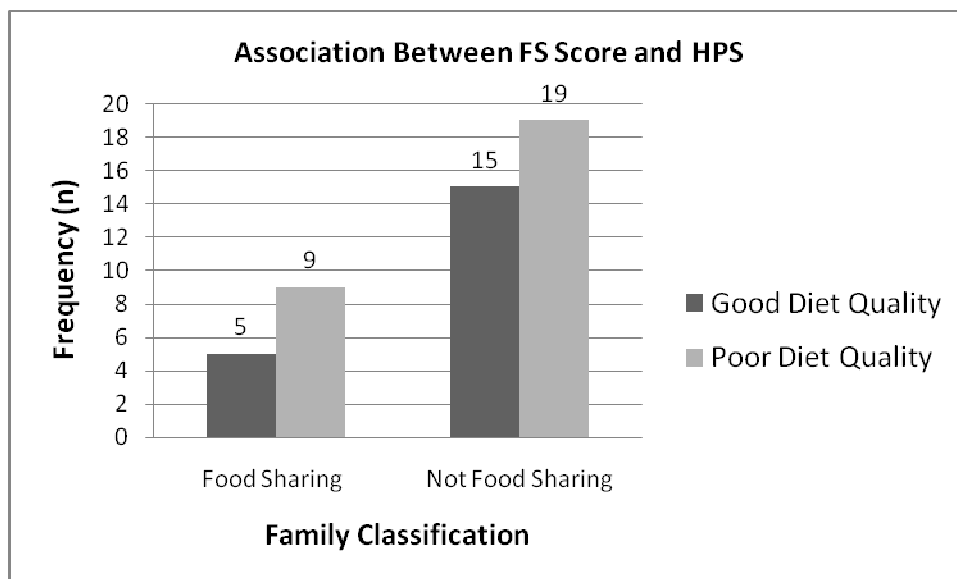


Figure . Association between dichotomized food sharing score and healthy plate score.

5.12.4 Formal Meals Typology

There was a significant association between the use of formal meal structuring and whether or not the family had a healthy diet quality $\chi^2(1)=5.0$, $p<.05$. Families were 5.82 times

more likely to have a good diet quality if they used formal meal structuring. In fact, only two (15.4%) of the families that did not use formal meal practices had a diet quality greater than 3. Most families in the bottom 25th percentile had poor diet quality (84.6%) while less than half (48.6%) of the top 75th percentile had poor diet quality. These results suggest that it is difficult to obtain a quality diet without formal meal structuring.

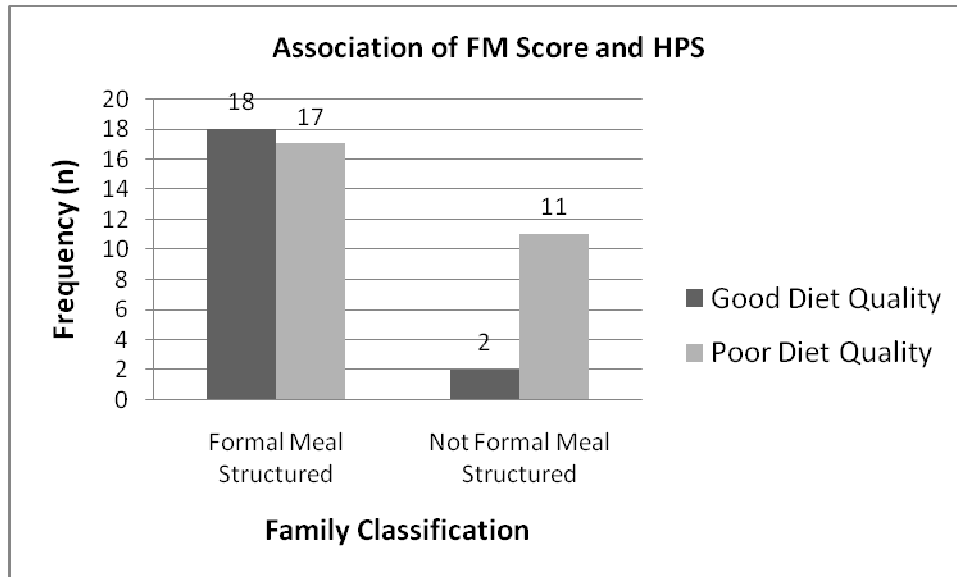


Figure . Association between dichotomized formal meal score and healthy plate score.

5.12.5 Meal Planning Typology

Diet quality was significantly associated with whether or not the family meal planned $\chi^2(1)=4.741$, $p<0.05$. Families were 3.75 times more likely to have a good diet quality if they plan for their meals than if they do not plan for their meals.

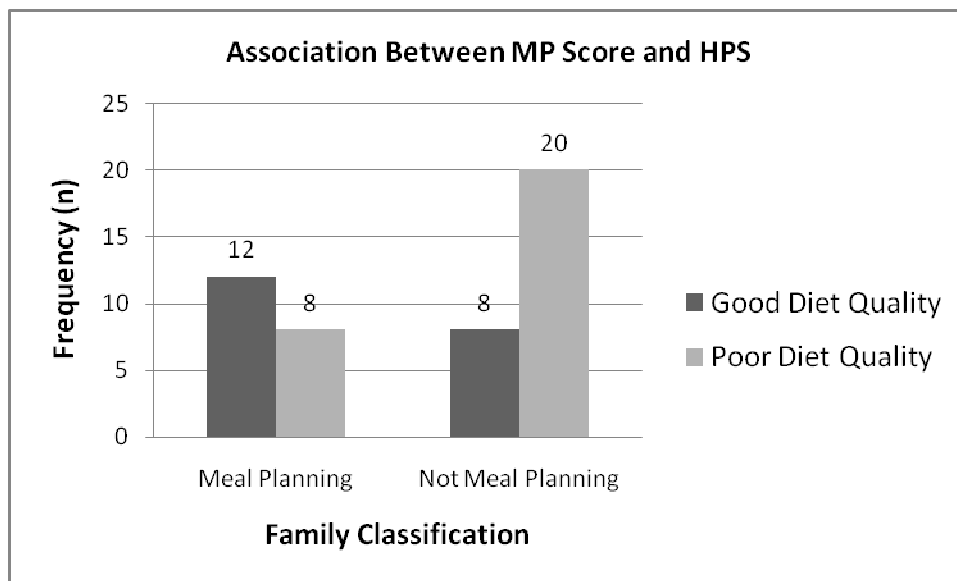


Figure . Association between dichotomized meal planning score and healthy plate score.

5.12.6 Overall Food Management Behaviours

The FMS was significantly related to diet quality $\chi^2(1)=11.429, p=.001$. Eight families scored in the top percentiles for all four typologies and five families scored in the bottom percentiles for all four typologies. Each of the top eight families had a HPS ≥ 4 and all of the bottom five families had a HPS ≤ 3 . The families in the middle had more variability in their HPS but a positive trend was found between the FMS and HPS ($p < .01$). Families with a FMS in the healthy category were 13 times more likely to have good diet quality.

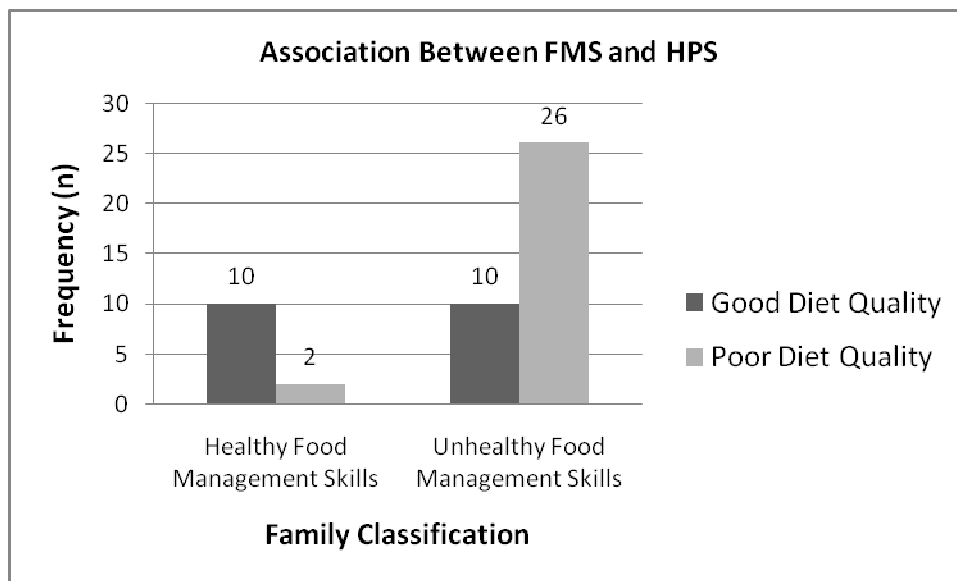


Figure . Association between dichotomized food management score and healthy plate score.

5.13 Relationship Between Food Management Strategies and Diet Quality

The strength of relationship between the typologies and the overall FMS, and the HPS, was tested using one-tailed Pearson's correlation. The HPS was significantly related to the healthy eating typology ($r = .277, p < .05$), the formal eating typology ($r = .305, p < .05$) and the meal planning typology ($r = .388, p < .01$) but not to the mother driven typology ($r = .182, p = .108$). The overall FMS was also significantly related to the HPS ($p < .01$). The linear relationships with these typologies could explain 7.7%, 9.3% and 15% of the variation in the family's diet quality, respectively while the overall FMS explained 18.3% of the variation in the HPS. Therefore, food management strategies had a medium effect on familial diet quality.



Figure . Relationship between the overall food management score and the healthy plate score.

5.14 Testimonies from Low-income Mothers

The mothers' hardships in trying to provide for their family are best articulated through the mothers' words;

"I use to glamorize the idea of being a single mother. Who needs a man anyway? But now that I have lived the life of a single mother it is just so hard. I really should volunteer to speak to young girls in high school and boys too. To tell them that it is just so hard. I mean you want to do everything for your child[ren] but it's just so hard" [testimony from a struggling working mother].

One mother spoke about the hopelessness of poverty;

"It's hard when you're a single mother. I tried working 3 jobs, I went back to school but now I'm on assistance. Unless you're a lawyer or doctor or something like that you just can't survive, you just don't have anything left after you pay for rent and bills...I'm lucky that I'm paying a mortgage now instead of rent but there still isn't enough money [for my family] to eat the foods that [they] should be eating" [Testimony from a mother of two on income assistance].

Another mother spoke about the difficulties living through the waxes and wanes of food availability and the added pressure this can put on a family;

"You buy all this healthy food, like fruit and vegetables, but then you end up throwing half of it out cause it's no good then you're hungry but there isn't anything left so you need to buy more....That was the worst about being on [assistance] your check would come and it pretty much just covered rent and bills then the baby bonus would come 2 weeks later so you could get groceries with that but it had to last you the whole month so you might have vegetables and fruit

in the beginning of the month but then you didn't have any left for the rest of it. So you're throwing out food but you still need more" [Testimony from a self-declared "working poor mother" who was formerly on income assistance].

Many mothers spoke about the sacrifices made for their family;

"[My boyfriend] always lets the children eat first before he eats and if there isn't anything left then he just won't have supper. [Stating that], He's really great like that."

"I would rather see the kids eat than me but I'm nursing so I have to....as long as I have meat, vegetables and milk at supper I'll be good."

When asked why a particular mother restricted milk, fruit and juice for her children she responded;

"Because it's healthy and it's for them"

One particular mother, who allowed her children to eat first, indicated that she only consumes the remaining food and sometimes this means that she does not eat supper. This happened the day the mother reported the family's diet quality and we were able to find that each child (n=3) had four eggs, one piece of toast, two pieces of bacon, one slice of baloney and one third of a large can of beans (youngest child also had one glass of milk) while the mother consumed nothing. In this instance, there was enough food to share; therefore, the children probably consumed excess calories and fat by the mother not eating.

Several mothers indicated that milk was restricted for the children and one mother stated that she restricted the milk for the youngest child and therefore her other children (≤ 12 years of age) did not have access to milk. There was further evidence of milk restriction but this evidence was not validated and therefore we can only speculate that milk was restricted in these households. In comparison, a second generation single mother said that her mother sacrificed her health for her children but she is trying to teach her own children that they need to take care of themselves. She believes that the best way to do this is to be a good role model so this particular mother was proud that she did not sacrifice her nutrition for her children's nutrition.

Some of the mothers indicated that they felt pressure from their children's school to change the foods they give to their families. One mother elaborated, stating the "lunch lady" regularly sticks her finger in her child's juice to taste it to make sure it is real juice and not Kool-aid and she also smells the children's food to make sure it is healthy. The mother now packs the juice label with her child's lunch so she can prove that her child is drinking real juice. Another woman spoke about her children's experience with school food programs;

"I know they use to go [to the school food program] but then there was a stigma or something about going so they wouldn't go anymore. I don't think they have them [at their school] anymore."

Another mother made a practical recommendation to increase the hours of the breakfast programs because as she stated,

"[The children] use the milk program [at school] but not the breakfast program because they don't get there quick enough on the bus".

6. DISCUSSION

6.1 Introduction

The goal of this project was to develop and validate an assessment tool able to identify families that may be at an increased risk of poor diet quality and food insecurity due to their food management behaviours. Our findings illustrate an independent association between familial diet quality and food management behaviours (FMB) among low-income mother-led households in Nova Scotia. Family members are interconnected and, as such, the family system is impacted by each member's behaviour and psychological processes that relate to food. Strong family support is therefore necessary to reach healthy nutrition outcomes. This research was the first to develop an index score able to identify and classify families based on the functionality of their environment in relation to diet quality. Using a dichotomized scoring scheme to classify both familial behaviour and diet quality, a diverse range of factors could be enmeshed into a basic score which allowed for a simple analysis of each family whereby significant factors were shown to either enable or protect against poor diet quality.

This was a continuation of The Hungry Mothers of Barely Fed Children Study wherein experiences with food by low income mother-led families over a one month income cycle were documented. Based on observations on these families, a second study titled The Impact of Intrafamilial Food Management Behaviours on the Diet Quality of Poor, Mother-led Families in Atlantic Canada developed food management typologies and a tool to assess diet quality called the Healthy Plate Score (HPS). The current research presents the validation of the food management behaviours (FMB), refinement of the HPS and synthesis of the Food Management Assessment tool, which can be used by lay health workers to evaluate FMB. While it is likely that all households regardless of their income level practice these behaviours, this research

focused on low income families because they are exceptionally vulnerable to poor health and diet quality (11, 32, 118).

This discussion gives meaning to the results provided in section 5 by providing a practical critique on how these findings may influence the practice of dietetics. Family Systems Theory was used to guide the discussion and to provide a framework from which to develop solutions. I focused on the use of the Food Management Assessment Tool including the HPS; behavioural warning signs healthcare workers should be aware of; needed changes in the way healthcare workers provide counseling, particularly to low-income populations; and needed policy changes.

6.2.0 Diet Quality

Diet quality was assessed using the HPS, a proxy measurement which was validated against a revised version of the Healthy Eating Index (HEI-C) (12). The HEI, originally developed by the United States Department of Agriculture to reflect adherence to the food guide and the dietary guidelines, is the most commonly used tool to assess dietary quality (119-121). As with the HEI-C, our diet assessment focused on compliance with EWCFG rather than specific nutrient levels (32, 122). This is a timely methodology as poor diet quality is mainly attributed to food group imbalances and energy and macronutrient excesses rather than nutrient deficiencies (19, 30, 122). Practitioners and clients, with limited time and resources, can use the HPS to conduct similar quality diet analysis to the HEI (12) but in a way that does not require use of nutrient analysis computer software. (122).

The HPS was designed to be implemented and interpreted by a health care practitioner with little or no nutrition background. Because there is no need for a computer, the HPS can tabulate a diet quality score and provide immediate feedback to the user. This was accomplished by developing an estimation tool that can predict if a meal contains $\leq$ or $>$ 30% of food energy

from fat, and by developing tools to assess the amount of limiting foods contained in a meal and to classify non-limiting food items as high in fat. Many programs and research studies use fat percentage intake as a health outcome (69, 123, 124) because it is an important indicator for cardiovascular disease and overall health (29, 33, 34, 124, 125); therefore, this section of the HPS could be incorporated into other tools and it could be used to help evaluate nutrition interventions, particularly heart health programs. The tool is dual purposed as it can also be used to teach nutrition education. Users can quickly identify problem areas and find easy cost effective solutions to qualitatively improve their diet quality. The simplicity of the tool would allow families to score their diet quality together in their home environment which may help increase compliance with dietary changes because it empowers the family to become self-reliant and to develop solutions together.

Family HPS averages were used to assess diet quality because, for the purpose of this study, optimum food management strategies are those that protect and promote healthy diet quality for the entire family. There should not have been a significant difference between familial diet quality and the diet qualities within the family for this method to yield valid results. In other words, familial diet quality should depict an accurate description of the overall diet quality within the home and be sensitive enough to detect discrepancies in diet quality found within the household i.e. a household in which the children have good diet quality but the mother has poor diet quality should score moderately low on the HPS. This assumption was supported during the first phase of this research project and for this research familial HPS captured most (60%) of the intrafamilial variability in the HPS.

Diet quality decreased across the province from west to east. A food costing study conducted in 2008 showed that the cost of healthy eating does not vary across Nova Scotia (11) suggesting that this difference is not related to food cost. However, it is also possible that the

sample size of the food costing study was not large enough to measure small regional differences that can impact individual access to food within an area. It is also possible that there are regional differences in the cost of non-food expenditures thereby reducing the family's food purchasing power (11). Food distribution systems within regions should be assessed to see if they are negatively impacting food security. Food costing studies, such as the Participatory Food Security Projects led by Williams (11), should continue to monitor the cost of eating nutritiously in various communities across the province.

6.3.0 Food Management Assessment Tool

The assessment tool (Appendix F) developed during this research project was successful in measuring food management behaviours that influence familial diet quality of low-income mother-led household with at least two children between the ages 2-14. It incorporated four dichotomous food management typologies: 1) The Mother Driven Household, 2) The Healthy Eating Household, 3) The Formal Meal Structured Household and 4) The Meal Planning Household. A scale to measure the family's resistance to change was also added to the tool. A fifth typology, called the Food Sharing Household, was initially incorporated but was removed because it failed to measure relevant food allocation behaviours. Each typology encompassed a range of behaviours and was developed as a means to understand the functionality of the family as related to food; in particular, the role(s) each member of the family held; the motivation(s) members use to guide their food choices; the habits, traditions and norms guiding family interactions and behaviours; the food skills held by the family; and the family's permeability to outside influences.

The overall food management score and the typology scores were not impacted by socio-demographic variables including household size, marital status, culture, education or region (Table 6). This suggests that the FMS assessment tool can measure universal food management

skills that affect all single mother Nova Scotian families. This is significant because food management strategies are highly influenced by familial norms, habits and traditions.

6.3.1. Mother Driven Typology and Diet Quality

On average, mothers scored the lowest on the mother driven typology than on the other three typologies. It has been well documented that low-income mothers feel a tremendous amount of guilt about not being able to provide for their family (127-129). Guilt may be the driving catalyst for this cluster of unhealthy FMB wherein mothers enable poor food habits if it provides short-term happiness to their children. Unfortunately, these short-term solutions have a negative long-term effect on the functionality of the household and as such the hierarchy within the family may need to be reorganized so that the mother, not the children, control household diet quality. To regain control over the family the mother may choose to utilize positive and negative feedback techniques so that over time the overall behaviour of the family changes to support better diet quality.

Some mothers seemed to feel bound to their current diet because they either fear that their children would not like a new food item or they believed they lack the opportunity to introduce new food effectively. Based on the testimonies provided by the mothers interviewed, it seems that community taste tests may be an effective method to improve family diet quality. Community organizations may be in a position to hold such an event where children could have the opportunity to try low-cost nutrient dense foods in a supportive environment with their peers. Implementing such a program may provide positive reinforcement to mothers to try new foods within the home because their children may become more open to the experience.

6.3.2 Healthy Eating Typology and Diet Quality

Most families scored in the midrange for the health eating typology. Since diet quality has a well know link to health it is likely that a mother would want to provide a healthy diet to

her family which was reflected in our results as all of the mothers practiced some healthy eating behaviours. However, the cost of eating healthy and lack of financial resources may influence the food standards of the home, and alter the family's focus away from health and onto more elemental motivations such as reducing hunger and short-term conflict (57, 79). A family with poor diet quality who scores as having a healthy eating focus may need to reassess the lower-order goals used in the home to see if they enable or hinder the family's higher-order goal of obtaining good diet quality. If a family scored as not having a healthy eating focus then the practitioner should begin behavioural intervention by helping the family to establish a healthier higher-order rule, using lower-order rules to support it. In this instance, it may be beneficial to discuss healthy eating in terms of reducing food insecurity by discussing behaviours not associated with added costs that can increase diet quality such as adopting healthy mealtimes and meal planning to help increase the variety in the diet and the likelihood that everyone will eat three meals per day.

6.3.3 Food Sharing Typology and Diet Quality

This typology was removed from the final tool. While the FST had an acceptable Cronbach's alpha, this was only achieved after removing half of the constructs and it did not relate to the diet quality of the family or individual members. Previous research has repeatedly shown a relationship between diet quality and family positions with younger members having the best diet quality and mothers having the worst diet quality (32, 69, 128, 129). These behaviours may be deeply rooted in implicit higher- and lower-order rules and as such family members may be unaware that some members are privileged over others. It is also possible that we did not see a relationship because of the questions used did not address the typology even though they appeared to.

The results of our research mirror other studies that have found mothers to sacrifice their diet quality for their children (68, 69, 78, 128, 129). We gained further insight by listening to the stories mothers told us about managing food. For example, many parents have normalized the behaviour as some were proud of the fact that they sacrifice their diet quality for their children and others had feelings of guilt if they were unable to sacrifice their diet quality. We also found evidence that some sacrifices were unnecessary as in instances when there was enough food to share; and therefore, parental sacrifice increased household food insecurity and decreased household diet quality because it lead to the consumption of excess calories and fat for some members of the family while other members skipped meals. It is unknown if mothers who sacrifice during unnecessary times do so because they lack the nutrition knowledge to know their is enough food to share, if they do so out of guilt (wanting to give what little they can to their children) or if it is caused by unhealthy food management strategy(s) that are simply accepted as normal behaviour(s).

Regardless of the cause, some sacrifices are unnecessary and may increase the risk of household food insecurity and poor diet quality. High- and low-order rules may need to be identified and altered to effectively stop mothers from practicing this behaviour. The members of a healthy eating household may be more apt to listen if advice was given in the perspective of improving household diet quality and instilling healthy food behaviours onto their children. In contrast, a household that is not healthy eating driven may benefit more if the advice is worded from the perspective of increasing household food security. Single mothers may benefit from health messages that support self-care especially if promoted as being a behaviour that can have a healthy influence on their children's health outcomes.

6.3.4 Formal Meal Structuring Typology and Diet Quality

Using formal meal structuring is important, especially for low-income families, because it is not associated with added costs and it has been shown to be an essential element to achieving a good diet quality (92, 130-132). In a national sample of school-aged children, watching television and having few family meals was associated with being overweight (131). Furthermore, adolescents of families who adopt healthy formal meal structuring, by frequently eating together in a structured and positive atmosphere and by making meal time a high priority, are less likely to suffer from disordered eating (133). In terms of diet quality, Neumark-Sztainer et. al. found a positive association between the frequency of family mealtimes and intake of total energy, protein, vegetables and fruit, and grain products, and a negative association with soft drinks (132). On a micronutrient level, a positive association was also found with calcium, folate, fibre, iron, antioxidants (Vitamins A, C, E) and vitamin B6 intakes (132).

It was not surprising that most families practiced formal meal structuring as it is a behaviour that is independent from financial resources and has been documented as being a behaviour regularly used in low-income households (12). Sim found formal meal structuring to be linked to familial food security levels, which supports the notion that families, especially low-income families, use FMB to help stabilize their system during threatening or unease times (12). This typology seemed to require the least amount of behaviours to reach the dichotomy threshold and therefore one can conclude that adopting the family ritual such that everyone eats supper together, without the distraction of television, could have a positive impact on the family's diet quality. Healthy meal times promote healthy outcomes (130) and family functioning, as eating together can reduce negative behaviours, and it gives the family an opportunity to interact and bond (134). Healthcare providers, especially dietitians, should assess family meal time practices

and encourage clients to strive for healthy mealtimes, which include eating together as a family without outside distractions such as television, and cooking in the home (132).

6.3.5 Meal Planning Typology and Diet Quality

The meal planning typology had the strongest linear relationship with diet quality, which parallels the findings in phase I wherein meal planning was the best predictor of good family diet quality (12). The more a family plans for meals the better the diet quality. Meal planning may increase the likelihood of consuming homemade meals which are generally more nutritious and cost effective than processed ready made foods. Consistent with previous research (12, 135), over half of the mother interviewed did not plan for their meals suggesting that they do not see this as a way to improve diet quality. While meal planning may take time, it does not increase the cost of healthy eating. This activity also represents a valuable skill that can be passed along from mothers to children.

Some low-income mothers may be resistant to meal planning because they feel that achieving good diet quality is impossible without an improvement in their financial situation, which may be true for some situations but not for all. Others may lack the skills needed to plan or to prepare homemade meals. But, in reality, all families can potentially adopt these practices; therefore, a practitioner may want to start the conversation by asking the mother or the family why they do not plan for their meals. This type of dialogue may expose unhealthy feedback loops or beliefs about meal planning that the practitioner may be able to change. For example, if the mother does not feel she has time to meal plan other family members may agree to take over the task, or to help more around the house so that the mother can spend more time on planning meals, or the family could get together to discuss different meal ideas which would help with compliance. Family members could volunteer to help prepare meals as well, which would provide positive feedback to the mother to plan for meals.

6.3.6 Overall Food Management Score and Diet Quality

Although a linear relationship was found with all but one typology, the association between the food management behaviours and diet quality were best described categorically; it seemed that family diet quality suffered the most once the family crossed the dichotomy threshold. In other words, families with healthy food management behaviours tend to have good diet quality; whereas, families with unhealthy food management behaviours tend to have poor diet quality. Therefore, it is less pragmatic to think that diet quality will increase incrementally with an increase in the food management scores as a threshold needed to be passed before most benefited from the behaviour.

Dichotomous cut-offs were based on the distribution of the scores, but in practice it would be more practical to base cut-off points on a specific percentage of healthy responses. Our cut-off scores, which were based on the 50% percentile mark or one of the 25% percentile marks, were around 50% (-5% to +15%); therefore, the assumption can be made that a score of 60% would be the best cut-off for behavioural classification i.e. family who score $\geq 60\%$ on a typology score do not need intervention in that particular area and nutrition interventions should be developed based on the notion that the family practices that particular cluster of behaviours. Families who score $\leq 60\%$ on the overall FMS would likely benefit the most from behavioural intervention.

The families who scored as having good diet quality were evenly distributed between having good and poor food management skills; however, almost all (93%) of the families that scored as having poor diet quality had poor overall food management skills. It seems that adopting good food management skills cannot guarantee good diet quality but having poor food management skills can virtually guarantee poor diet quality. These results are not surprising because food management strategies are the foundation families need to build a healthy system

that is able to function and thrive. If the family is lacking in one or more of these resources they are placing their system at risk because it may not be able to adapt to changing environments and protect itself against unhealthy influences.

6.4. Impede Communication Barriers

Lack of resources to purchase food impacted on the ability of these mothers to follow medical advice. A significant number of mothers reported that they suffered from a medical condition and some believed that they could not afford to follow the medical advice given to them to manage their condition(s). Practitioners need to be aware that some clients might not be willing or able to listen to medical interventions if they do not believe they are in the position to follow the advice. Therefore, advice needs to be presented in such a way that it can break through the communication barriers that surround the individual to allow entrance into the family system. This may be accomplished by slowly promoting small inexpensive changes (“deviation dampening” solutions) so over time greater diet quality changes can be made.

6.5. Reducing Barriers

The directives for the Food and Nutrition Policy for Nova Scotia Public Schools (FNP for NSPS) are to set standards for the type of food and beverages “served” in the schools and to use the curriculum and community to build healthy environments that support healthy eating and physical activity (63). Unfortunately, it seems that some faculty members and schools have gone beyond these directives to include restrictions on the foods brought into the school by the children for both snacks and lunch. This seems to put added strain on low-income families. More needs to be done to educate school faculty members and administrators on the negative impact that these types of restrictions can have on a child and their family and to ensure food programs are accessible to all of the children.

6.6. Limitations of the Study Implications for Future Research

The present study had a few limitations that should be mentioned. The cross-sectional design used for this research prevents us from concluding that having more, healthier food management behaviours directly improves diet quality. Longitudinal studies are needed to assess the cause and effect relationship between food management behaviours and familial diet quality. It would be interesting to see if improvements in the family system continue into advancing life-stages and future generations and onto family branches e.g. a son or daughter who marries and starts their own family. Also, we chose to use a sampling approach appropriate for “difficult to sample groups” (66) to ensure our sample included families from all regions and common cultural backgrounds found in Nova Scotia because food management behaviours are highly influenced by culture. Therefore, our sample is not representative of all low-income single mothers. However, the mothers interviewed were typical and provided a good representation of low-income, mother led families living in Nova Scotia with at least two children between the ages 2-14. Also, we were unable to use a more rigorous method for testing the reliability of the tool because we had too few participants. Comparison methods should be used, in which the data are split into two halves and comparisons are made, to ensure the results are reproducible. However, our results were similar to those found in the first phase of the project which explored the same components using secondary data. Lastly, the present study could not assess behaviours that cause mothers to have lower diet quality than their children. Future research should explore this area.

Although safeguards were taken to ensure the interview questions were non-invasive, e.g. questions about income level were removed from the tool, the tool was pilot tested to ensure questions were respectful and worded in a non-judgmental manner and each participant was asked to provide feedback on the interview, we feel that some of the participants’ answers may

have been influenced by their reluctance to admit that they may practice some unhealthy food management behaviours. For instance, during the diet quality assessment one mother reported that she did not eat supper the day prior to the interview because she allowed her children to eat first to make sure her children had enough food to eat; and therefore, there was no food available for the mother to eat. In contrast, during the food management (FM) assessment, the same mother said that she always ate supper with her children, that they ate at the same time every night, that she always ate three meals a day and that she was never food insecure. Clearly, the mother's FMS responses did not paint a clear picture of the everyday reality for that family. However, this limitation would be the same for any study conducted on sensitive subject matter and the majority of the mothers seemed to feel comfortable to provide accurate responses to the questions asked during the interview. In the future, it would be interesting to see the results of a self-administered questionnaire; although, if the tool was self-administered the literacy and comprehension level of the participants may cause additional problems and it would not guarantee objectivity. Another solution could be to include cross-checks in the tool that would allow the administrator to modify answers given in the behaviour assessment based on information provided in the diet assessment portion of the tool. Future research may also want to include the children or interview the entire family to gain a more objective perspective of the family environment.

A discrepancy between the mothers' perceived food security level and their actual food security level could also be the cause of these results and may explain why it was difficult to find participants for the study. In using Family Systems Theory to understand the family it is important to view the family through the mother's perspective rather than from the researcher's perspective. Families behave differently depending on their perceived level of food security. Some mothers may be happy as long as their children are not complaining about being hungry

and that may be their highest standard in food security. A mother may indicate that she does not worry about running out of food, but she may have answered the question from the perspective of not having enough for her children because she knows she can always not eat to give her children what they need. One mother regularly relied on family supports to help with food costs and received social support to help with costs associated with a nutrition-related medical condition. From the view of a researcher, relying on these resources puts the family at risk for being food insecure because they are not self-reliant methods. But the mother was content and happy and perceived her family as being food secure stating that she was “lucky” compared to a lot of other people in her situation because she did not have to worry. This family, and others like it, would be unlikely to seek help because they are unaware that they are food insecure because their idea of food security is very different from our view of being food secure.

The general consensus among dietitians and nutritionists is that low-income families cannot afford to eat the optimal diet promoted in EWCFG (60, 74, 119). This study does not contradict that fact; it does however, provide a tool that can help families improve their diet quality. Steps should continue to be made to help increase the resources available to low income families. However, healthcare workers, particularly those working with low-income individuals, should be aware of family behaviours that may affect a family’s diet quality and work with the family to help improve their food management skills if deemed appropriate. Especially since there is a lack of scientific evidence that can link a direct causal effect between increasing resources and improving diet quality. Our results suggest that it is unlikely that increased financial resources alone will improve diet quality as a family would likely continue to practice the same behaviours with more money because unhealthy behaviours are ingrained into the functionality of the family system and as such, families who use poor FMS would lack the support necessary to achieve improved diet quality.

Further research could be conducted with food secure families based on income criteria. We predict that FMS affect the diet quality of all families regardless of their income. When financial barriers are removed there may be more potential dietary change available to families and therefore FMS may be more likely to influence a families' diet quality. On the other hand, food secure families may not need to rely on FMS to the same degree as food insecure families to obtain a good diet quality and therefore FMS might have less of an influence on the diet quality of food secure families.

To our knowledge, this has been the first study to use Family Systems Theory to lead the analysis of a nutrition related study. The results of this study illustrate the importance of using the suprasystem to identify the norms that exist within, between and surrounding the everyday reality of the family (20, 21) because it can significantly impact a family's diet quality. Practitioners could use the lens of Family Systems Theory to help families become aware of the factors that affect food choices and to develop management strategies to help change their suprasystem so that it supports a higher diet quality for its direct members (20). Furthermore, having a greater understanding of the family's reality allows for a more empathetic approach—a skill that supports effective communication and counseling (20).

The implications of these results for programs are considerable. In terms of nutrition education, classes could be developed around the HPS whereby participants could learn how to plan a healthy meal within their means. Furthermore, the classes could be conducted by community workers that do not have a nutrition background; ultimately, making the course more feasible for community organizations that do not have access to the services provided by a Registered Dietitian. Health providers could use the behavioural assessment component to help identify familial level risk factors to poor diet quality.

Although, 34 community organizations and businesses agreed to help recruit participants for the study, data collection took approximately 18 months to complete. Data collection was stagnant during the first 10 months of recruitment. This was mainly due to the following factors: bad timing, as many of the centers were busy or closed; miscommunication, as many centers felt that they only needed to put up the poster, which was ineffective without added advertisement/involvement of workers; and lack of potential participants as most programs held at Family Resource Centers are for women with children under the age of two or for pre- and post-natal programs. It seemed that the strongest barrier to recruitment was a lack of women who met the study's criteria. Many women had one child who fell within the accepted age range and another child who was outside the age range. Statistics Canada states that in 2006, 14 250 lone mother families with at least two dependent children lived in Nova Scotia and there were 6000 low-income single mother families living in the province. Therefore, it can be assumed that a large number of Nova Scotian families that met the study's inclusion criteria for both income level and family structure are not accessing community supports. Another barrier to recruitment was participant's apprehension to participate in a research study. The most common reasons stated for their hesitation to participate were fear that social services would obtain the information and use it against the mother, fear of being judged, shame/embarrassment of their current situation, and lack of time. Healthcare workers that work with vulnerable populations such as low-income family should practice with the understanding that many people in such situations feel these types of emotions. Practitioners may be able to reduce these feelings by ensuring they do not hold negative prejudices or assumptions about the population and try to empathize with them.

7.0 Outcome Statements

- 1) Community programs should be developed based on the Food Management Assessment Tool. The majority of the mothers scored high on at least one aspect of the tool and therefore peer lead programs could be developed so that mothers could learn healthy food management skills from each other. Such a program would be a good source of self-esteem for the participants. The behaviour assessment component could be used to assess participants and evaluate programs and the diet quality component could be used to provide nutrition education, to assess participants and to evaluate programs. The estimation tool could be incorporated into other tools or could be used by programs to monitor health outcomes such as achieving a fat intake percentage $\leq 30\%$ of total food energy.
- 2) Community taste tests may be an effective method to reduce some of the barriers to getting children to try new foods. Community organization may be in a position to hold such an event where children could have the opportunity to try low-cost nutrient dense foods in a supportive environment with their peers.
- 3) Policy makers need to understand that interventions need to incorporate both increased financial resources and behavioural intervention to effectively promote healthy dietary changes among low-income populations. Food management behaviours help to keep family systems functioning and they are bound to the family via homeostasis laws; therefore, if the family practices unhealthy food management behaviours increased income alone is unlikely to promote healthy dietary changes as they may continue to practice the same behaviours with more money. Diet quality change can only be accomplished by reorganizing the family system so that it supports healthy changes. Health professionals and community organizations should do their part to advocate for

increased and sustained financial support for such programs because it is likely to lead to positive health outcomes which may lead to lower healthcare costs.

- 4) Nutrition interventions should be conducted using a family counseling approach to ensure the clients' family system supports healthy dietary changes. Using Family Systems Theory to guide interventions the practitioner can work with families to lessen deviations from family health goals and increase the family's environmental support system.
- 5) Research shows that low-income mothers are one of the most vulnerable demographics for food insecurity. In some situations it is unnecessary for mothers to sacrifice their health for their children; as sacrificial behaviours such as allowing the children to eat first or reserving milk for children are sometime motivated by internal feels of guilt or poor nutrition knowledge rather than healthy decision making (as when necessary sacrifice are made). Public health messages and community programs should promote messages that support mothers to take care of their own health with the aim of reducing poor physical and psychological health among this population. Healthy messages may be more effective if they emphasis on the positive effect it may have on the family if the mother improves the care she gives to herself such as being a healthy role model and instilling healthy food practices onto her children.

8.0 CONCLUSION

This study supports the theory that familial environments contribute to poor familial diet quality for low-income households. When working with low-income families to improve diet quality, health providers should assess the food management behaviours family's use to guide food decisions made within the home. This approach will allow health providers to identify behaviours that increase household risk of consuming a poor quality diet, and because these factors are independent from income, the health provider can start to develop practical and effective solutions with the client. Advice and interventions should be provided and developed so that it has the most effect for the client; this involves a family counseling approach tailored to the unique needs of the family.

We successfully developed and validated a reliable cost-effective food management assessment tool that can be administered with minimal training in diet assessment techniques; the tool includes a proxy diet quality assessment tool known as the HPS. The HPS was designed so users could score their meal within minutes without computer software. Thus, the HPS provides immediate feedback to participants. This research was the first to develop an index score able to identify and classify families based on the functionality of their environment in relation to diet quality. Using a dichotomized scoring scheme to classify both familial behaviour and diet quality a diverse range of factors could be enmeshed into a basic score which allowed for a simple analysis of each family whereby significant factors were shown to either enable or protect against poor diet quality.

9.0 REFERENCES

1. Rosal MC. Facilitating dietary change: The patient-centered counseling model. *J Am Diet Assoc.* 2001;101:332-41.
2. Rimer B, Kreuter M. Advancing tailored health communication: A persuasion and message effects perspective. *J Commun.* 2006;56:S184-201.
3. Kreuter M, Oswald D, Bull F, Clark E. Are tailored health education materials always more effective than non-tailored materials? *Health Educ Res.* 2000;15:305-15.
4. Wolpert HA,. Management of diabetes: Are doctors framing the benefits from the wrong perspective? *BMJ.* 2001;323(7319):994-6.
5. Cummins S, Macintyre S. Food environments and obesity--neighbourhood or nation? *Int J Epid.* 2006;35:100-4.
6. Mackenzie M. 'Doing' public health and 'making' public health practitioners: Putting policy into practice in 'Starting well'. *Soc Sci Med.* 2008;1028-37.
7. Cox R, White A, Gaylord C. A video lesson series is effective in changing the dietary intakes and food-related behaviors of low-income homemakers. *J Am Diet Assoc.* 2003;103:1488-93.
8. Wall D, Gromis J, Lohse B. Intention to consume fruits and vegetables does not directly translate to behavior in a low income sample. *J Nutr Educ Behav.* 2008;40:S67.

9. United States Department of Agriculture. Food stamp nutrition education plan guidance, federal fiscal year 2006. Alexandria, VA: Food and Nutrition Service, Food Stamp Program; 2005. Report No.: 22302-1500.
10. Atlantic Health Promotion Research Center, Family Resources Centres/ Projects, & Nova Scotia Nutrition Council, Building food security in Nova Scotia through participatory food costing 2004/05 food costing update. 2006.
11. Nova Scotia Participatory Food Security Projects. Report of 2008 food costing study, cost and affordability of a nutritious diet in Nova Scotia. 2009.
12. Sim M, Glanville T, McIntyre L. The impact of intrafamilial food distribution patterns on the diet quality of poor, mother-led families in Atlantic Canada. 2006. Final Report. Danone Institute of Canada.
13. Davis B., Tarasuk V. Hunger in Canada. Agric Human Values. 1994;11(4):50-7.
14. Canada's action plan for food security - a response from the world food summit. Available from: <http://www.agr.ca/misb/fsb/fsap/fsape.html>.
15. Radimer K, Olson C, Greene J. Understanding hunger and developing indicators to assess it in women and children. J Nutr Educ. 1992;24:365-455.
16. Nova Scotia participatory food cost project: Food security for all building capacity for policy change. 2009 April 2009. Available from: <http://faculty.msvu.ca/foodsecurityprojects/Food%20Security.htm>.

17. Power E. Determinants of healthy eating among low-income Canadians. *Can J Public Health*. 2005;96(suppl):37--43.
18. Statistics Canada. Canadian Community Health Survey (Cycle 1.1). Ottawa, Canada: 2001.
19. Garriguet D. Nutrition: Findings from the Canadian Community Health Survey (Cycle 2.2). Overview of Canadians eating habits 2004. Minister of Industry, 2006; Report No.: Catalogue no. 82-620-MIE — No. 2.
20. Bisogni C, Jastran M, Shen L, Devine A. A biographical study of food choice capacity: Standards, circumstances, and food management skills. *J Nutr Educ Behav*. 2005;37:284---291.
21. Abye b, Devine C, Odoms-Young A. Values expressed through intergenerational family food and nutrition management systems among African American women. *Fam Community Health*. 2006;29:5--16.
22. Knol L, Haughton B, Fitzhugh E. Dietary patterns of young low-income US children. *J Am Diet Assoc*. 2005;105:1765--1773.
23. Health Canada. Canada's Food Guide to Healthy Eating assessment relative to dietary reference intakes. 2003 [cited 2007 Jan 1].
24. Nutrition policies and dietary guidance in Canada. Available from: http://www.hc-sc.gc.ca/fn-an/nutrition/diet-guide-nutri/nut_pol_diet_guid-pol_nut_lig_direct_e.html.
25. Health Canada. Eating Well with Canada's Food Guide. Ottawa: 2007.

26. Murphy S, Guenther P, Kretsch M. Commentary using the dietary reference intakes to assess intakes of groups: Pitfalls to avoid. *J Am Diet Assoc.* 2006(106):1550-3.
27. Earl R, Borra S, Thomas P. Guidelines for dietary planning. In: Mahan L, Escott-Stump S, editors. *Krause's Food, Nutrition & Diet Therapy.* 11th ed. United States of America: Elsevier; 2004. p. 364-7.
28. Block G, Gillespie C, Rosenbaum E, Jenson C. A rapid food screener to assess fat and fruit and vegetable intake. *Am J Prev Med.* 2000;18:284-8.
29. Howard B, Van Horn L, Hsia J, Manson J, Stefanick M, Wassertheil-Smoller S, et al. Low-fat dietary pattern and risk of cardiovascular disease: The Women's health initiative randomized controlled dietary modification trial. *JAMA.* 2006;295:655-66.
30. US Department of Health and Human Services. *Tracking healthy people 2010.* Washington, DC: US Government Printing Office; 2000.
31. Kant AK,. Dietary patterns and health outcomes. *J Am Diet Assoc.* 2004;104:615-35.
32. Glanville N, McIntyre L. Diet quality of Atlantic families headed by single mothers. *Can J Diet Prac Res.* 2006;67:28-35.
33. Winters B, Mitchell D, Smiciklas-Wright H, Grosvenor M, Liu W, Blackburn G. Dietary patterns in women treated for breast cancer who successfully reduce fat intake: The Women's intervention nutrition study (WINS). *J Am Diet Assoc.* 2004;104:551-9.

34. Barnard N, Scialli A, Turner-McGrievy G, Lanou A, Glass J. The effects of a low-fat, plant-based dietary intervention on body weight, metabolism, and insulin sensitivity. *Am J Med.* 2005;118:991-7.
35. Hebert J, Patterson R, Gorfine M, Ebbeling C, St Jeor S, Chlebowski R. Differences between estimated caloric requirements and self-reported caloric intake in the women's health initiative. *Ann Epidemiol.* 2003;13:629-37.
36. Yaroch A, Resnicow K, Petty A, Khan L. Validity and reliability of a modified qualitative dietary fat index in low-income, overweight, African American adolescent girls. *J Am Diet Assoc.* 2000;100:1525-9.
37. Thompson F, Midthune D, Subar A, Kipnis V, Kahle L, Schatzkin A. Development and evaluation of a short instrument to estimate usual dietary intake of percent energy from fat. *J Am Diet Assoc.* 2007;107:760-7.
38. Percent energy from fat screener 2008. Available from:
<http://www.riskfactor.cancer.gov/diet/screeners/fat>.
39. Anderson J, Hanna T, Peng X, Kryscio R. Whole grain foods and heart disease risk. *J Am Coll Nutr.* 2000;19:291S-9S.
40. Genest J, Frohlich J, Fodor G, McPherson R, (Working Group on Hypercholesterolemia and Other Dyslipidemias). Recommendations for the management of dyslipidemia and the prevention of cardiovascular disease: 2003 update. *Can Med Assoc J.* 2003.

41. NIH Consensus Development Panel on Osteoporosis Prevention. Osteoporosis prevention, diagnosis and therapy. JAMA. 2001;285:785-95.
42. American diabetes Association. Evidence-based nutrition principles and recommendations for treatment and prevention of diabetes and related complications [position statement]. Diabetes Care. 2002;25:S50-60.
43. Taylor R, McAuley K, Barbezat W, Farmer V, Williams S, Mann J, et al. Two year follow-up of an obesity prevention initiative in children: The apple project. Am J Clin Nutr. 2008 88:1371-7.
44. Prentice R, Caan B, Chlebowski R, Patterson R, Kuller L, Ockene J, et al. Low-fat dietary pattern and risk of breast cancer: The Women's health initiative randomized controlled modification trial. JAMA. 2006;295:629-42.
45. Grau M, Baron B, Sandler R, Wallace K, Haile R, Church T, et al. Prolonged effect of calcium supplementation on risk of colorectal adenomas in a randomized trial. J Natl Cancer Inst. 2007;99:129-36.
46. Shields M, Tjepkema M. Trends on adult obesity. Ottawa, Ontario: Health Reports (Statistics Canada, Catalogue 82-003); 2006. Report No.: 2005003.
47. Schultz S, Kopec J. Impact of chronic conditions. Ottawa, Ontario, Canada: Health Reports; 2003. Report No.: 82-003 XIE.
48. Canadian Cancer Society. 12 June 2006. Available from:
http://www.cancer.ca/ccs/internet/standard/0,3182,3172_150407210_langId-en,00.html.

49. Food and Nutrition Board. Diet and health: Implications for reducing chronic disease risk. Washington, DC: National Academy Press; 1989.
50. Drewnowski A. Taste preferences and food intake. *Annu Rev Nutr.* 1997;17:237.
51. Salbe AD. Taste preferences and body weight changes in an obesity-prone population. *Am J Clin Nutr.* 2004;79:372-8.
52. Hersey J, Anliker J, Miller c, Mullis R, Daugherty S, Das S, et al. Food shopping practices are associated with dietary quality in low-income households. *J Nutr Educ.* 2001;33:S16--S27.
53. Herzler A. Children's food patterns-a review. *J Am Diet Assoc.* 1983;83:551-8.
54. Bourdeaudhuij I. Family food rules and healthy eating in adolescents. *J Health Psych.* 1997;2:45-56.
55. Hertzler AA,. Culture, families, and the change process--a systems approach. *J Am Diet Assoc.* 1984;84:535,40, 543.
56. Townsend M, Kaiser L. Development of a tool to assess psychosocial indicators of fruit and vegetable intake for 2 federal programs. *J Nutr Educ Behav.* 2005;37:170-84.
57. Drewnowski A. Food choices and diet costs: An economic analysis. *J Nutr.* 2005;135:900-4.
58. Jacobs Starkey L. Montreal food bank users' intakes compared with recommendations of Canada's Food Guide to Healthy Eating. *Can J Diet Pract Res.* 2000;61:73-5.
59. Connors M, Bisogni C, Sobal J, Devine C. Managing values in personal food systems. *Appetite.* 2001;36:189-200.

60. Mendoza J, Drewnowski A, Cheadle A, Christakis D. Dietary energy density is associated with selected predictors of obesity in U.S. children. *J Nutr.* 2006;136:1318-23.
61. Policy Working Group of Nova Scotia., Participatory Food Security Projects. Thought about food? Understanding the relationship between public policy and food security in Nova Scotia. Nova Scotia: Atlantic Health Promotion Research Centre, Nova Scotia Nutrition Council and Collaborating Family Resource Centres/Projects; 2006. Report No.: ISBN 0-7703-8074-3.
62. Ong'wen O, Wright S. Small farmers and the future of sustainable agriculture. Ecofair trade dialogue. 2007; Discussion Paper no. 7.
63. Nova Scotia Department of Education and Nova Scotia Department of Health Promotion and Protection. Food and nutrition policy for Nova Scotia public schools: Policy directives and guidelines. 2006.
64. Ontario Society of Nutrition Professionals in Public Health (OSNPPH) School Nutrition Workgroup Steering Committee. Call to action: Creating a healthy school nutrition environment. 2004.
65. Briggs M, Safaii S, Beall D. Position of the American Dietetic Association, Society for Nutrition Education, and American School Food Service Association. Nutrition services: An essential component of comprehensive school health programs. *J Am Diet Assoc.* 2003;103:505-14.
66. McIntyre L, Glanville T, Officer S, Anderson B, Raine K, Dayle J. Food insecurity of low-income lone mothers and their children in Atlantic Canada. *Can J Public Health.* 2002;93:411-6.

67. Frank J, Finegood D. Foreword from the Canadian Institutes of Health Research. *Can J Public Health*. 2005;96:S5.
68. Tarasuk V, Beaton G. Women's dietary intake in the context of household food insecurity. *J Nutr*. 1999;129:672-9.
69. McIntyre L, Glanville T, Raine K, Dayle J, Anderson B, Battaglia N. Do low-income lone mothers compromise their nutrition to feed their children? *Can Med Assoc J*. 2003;168:686-691.
70. Health Canada. Canadian Community Health Survey, Cycle 2.2, Nutrition (2004): Income-related household food security in Canada. 2004. Report No.: HC Pub. No. 4696.
71. Nord M, Brent C. Food insecurity in higher income households. Washington, DC: USDA Economic Research Service; 2002. Report No.: E-FAN-02-016.
72. Broughton M, Janssen P, Hertzman C, Innis S, Frankish C. Predictors and outcomes of household food insecurity among inner city families with preschool children in Vancouver. *Can J Public Health*. 2006;97:214-6.
73. Bowman S. A comparison of the socioeconomic characteristics, dietary practices, and health status of women food shoppers with different food price attitudes. *Nutr Res*. 2006;26:318-24.
74. Vozoris N, Davis B, Tarasuk V. The affordability of nutritious diets for households on welfare in Toronto. *Can J Public Health*. 2002;93:36-40.
75. Travers K, Cogdon A, McDonald W, Wright C, Anderson B, MacLean D. Availability and cost of heart healthy dietary changes in Nova Scotia. *J Can Diet Assoc*. 1997;58:176-83.

76. Drewnowski A. Obesity and the food environment: Dietary energy density and diet costs. *Am J Prev Med.* 2004;27(3 Suppl):154-62.
77. Drewnowski A, Darmon N. The economics of obesity: Dietary energy density and energy cost. *Am J Clin Nutr.* 2005;82(1):265S-73S.
78. Glanville T, McIntyre L. Diet quality of low-income lone mothers and their children living in atlantic canada. *Can J Diet Prac* 67:28-35.
79. Kempson K, Keenan D, Sadani P, Adler A. Maintaining food sufficiency: Coping strategies identified by limited-resource individuals versus nutrition educators. *J Nutr Educ Behav.* 2003;35:179--189.
80. Teron C, Tarasul S. Charitable food assistance: What are food bank users receiving? *Can J Public Health.* 1999;90:382-84.
81. United States Department of Agriculture. Expanded food and nutrition education program FY 2003 program impacts. 2004.
82. Lin B. Diet quality usually varies by income status. *Amber Waves.* 2005;3:5.
83. Shepherd R, Paisey c, Spark P, Anderson A, et al. Constraints on dietary choice: The role of income. *Nutr Food Sci.* 1996;5:19.
84. Davidson R, Kitzinger J, Hunt K. The wealthy get healthy, the poor get poorly? lay perceptions of health inequalities. *Soc Sci Med* 2006;62:2171-82.

85. Variyam J, Blaylock J, Smallwood D. USDA's healthy eating index and nutrition information. Washington, DC: Rural Economics Division, Economic Research Service, and Center for Nutrition Policy, USDA; 1998. Report No.: Technical Bulletin No. 1866.
86. Jain A, Sherman s, Chamberlin L, Carter Y, Powers S, Whitaker R. Why don't low-income mothers worry about their preschoolers being overweight? *Am Acad Pediatr*. 2001;107:1138--1146.
87. Anding J, Fletcher R, Laanen P, Supak S. The food stamp nutrition education program's (FSNEP) impact on selected food and nutrition behaviors among Texans. *J Exten*. 2001;39:6.
88. Mclaughlin C, Tarasuk v, Kreiger N. An examination of at-home food preparation activity among low-income, food insecure women. *J Am Diet Assoc*. 2003;103:1506-12.
89. Musher-Eizenman D, Lauzon-Guillain B, Holub S, Leporc E, Charles M. Child and parent characteristics related to parental feeding practices. A cross-cultural examination in the US and France. *Appetite*. 2009;52:89-95.
90. Birch L, Davison K. Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. *Pediatr Clin North Am*. 2001;48:893-907.
91. Spruijt-Metz D, Lindquist C, Birch L, Fisher J, Goran M. Relation between mothers' child-feeding practices and children's adiposity. *Am J Clin Nutr*. 2002;75:581-6.
92. Gillman M, Rifas-Shiman S, Frazier A, Rockett H, Camargo C, Field A. Family dinner and diet quality among older children and adolescents *Arch Fam Med*. 2000.

93. Carper J, Fisher J, Birch L. Young girls' emerging dietary restraint and disinhibition are related to parental control in child feeding. *Appetite*. 2000;35:121-9.
94. Faith M, Scanlon K, Birch L, Francis L, Sherry B. Parent-child feeding strategies and their relationships to child eating and weight status . *Obesity*. 2004;12:1711-22.
95. Farmer A, Tiefenthaler J. Fairness concept and the intrahousehold allocation of resources *Journal of Development Economics*. 1995;47:179--189.
96. Kazak A, Simms S, Rourke M. Family systems practice in pediatric psychology. *J Pediatric Psychol*. 2002;27:133-43.
97. Health literacy in Canada: Initial results from the international adult literacy and skills survey 2007. 2007;Ottawa.
98. Brink S. Adult literacy and life skills (ALL) survey 2003 - key research findings and HRSD implications. 2005.
99. Federal, Provincial and Territorial Advisory Committee on Population Health. Report on the health of Canadians. Ottawa: 1996.
100. Ottawa charter for health promotion:
http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf . 1986.
101. Kasila K, Poskiparta M, Karhila P, Kettunen T. Patients' readiness for dietary change at the beginning of counseling: A transtheoretical model-based assessment. *J Hum Nutr Diet*. 2003;16:159-66.

102. Determinants of health. Available from: http://www.phac-aspc.gc.ca/media/nr-rp/2006/2006_06bk2_e.html.
103. Brug J. The impact of computer-tailored feedback and iterative feedback on fat, fruit, and vegetable intake. *Health Educ.* 1998;25:517-31.
104. Elliott R. Motivational interviewing--preparing people to change addictive behaviour J *Community Health.* 1993;3:169-71.
105. Chamberlin L, Sherman S, Jain A, Power S, Whtaker R. The challenge of preventing and treating obesity in low-income preschool children. *Arch Pediatr Adoesc Med.* 2002;156:662--668.
106. White J, Klein D. The systems framework In: Adams B, Klein D, editors. *Family Theories.* 2nd ed. Thousand Oaks, London, New Delhi: Sage Publications; 2002;117-42.
107. Ingoldsby BB, Smith SR, Miller JE. Family systems theory. In: Ingoldsby BB, Smith SR, Miller JE, editor. Los Angeles: Roxbury Publishing Company; 2004; 167-79.
108. McGoldrick M, Gerson R, Petri S, editors. *Genograms: Bowen on triangles.* 3rd ed. New York: W.W. Norton; 1974.
109. Johnson S, Birch L. Parents' and children's adiposity and eating style. *Pediatrics.* 1994;94:653-61. Available from: <http://www.ncbi.nlm.nih.gov/sites/entrez?Db=pubmed&Cmd=ShowDetailView&TermToSearch=7936891>.

110. Zisberg A, Young H, Schepp K, Zysberg L. A concept analysis of routine: Relevance to nursing. *J Adv Nurs*. 2007;57:442-53.
111. Health Canada. Relating Eating Well with Canada's Food Guide to Canadian Nutrient File foods: Thresholds for assigning foods to specific groups and subgroups 2007. 2007.
112. Health Canada. Canadian Nutrient File, 2007b version; www.healthcanada.ca/cnf.
113. Health Canada. The nutrient value of some common foods (NVSCF) booklet. Health Canada; 2008. Report No.: H164-49/2008E.
114. Boutelle, K., Lytle, L., Murray, D., Birnbaum, A., Story, M. Perception of the family mealtime environment and adolescent mealtime behaviour: Do adults and adolescents agree? *J Nutr Educ*. 2001;33:128-33.
115. Kline P. The handbook of psychological testing. 2nd ed. London: Routledge: 1999.
116. Field A. Discovering statistics using SPSS. 2nd ed. Wright D, editor. SAGA; 2005.
117. Loewenthal K, editor. Introduction to psychological tests and scales. 2nd ed. Psychology Press; 2001.
118. Statistics Canada. Canadian Community Healthy Survey, Cycle 2.2, Nutrition. 2005.
119. Hann CS., Rock CL., King I., Drewnowski A. Validation of the healthy eating index with use of biomarkers in a clinical sample of women. *Am J Clin Nutr*. 2001;74:479-86.
120. Guenther P, Reedy J, Krebs-Smith S, Reeve B. Evaluation of the healthy eating index-2005. *J Am Diet Assoc*;108:1854-64.

121. Freedman L, Guenther P, Krebs-Smith S, Kott P. A population's mean healthy eating index-2005 scores are best estimated by the score of the population ratio when one 24-hour recall is available. *J Nutr.* 2008 138:1725-1729.
122. Kennedy E, Ohls J, Carlson S, Fleming K. The healthy eating index: Design and application. *J Am Diet Assoc.* 1995;95:1103-8.
123. Veugeliers P, Fitzgerald A. Effectiveness of school programs in preventing childhood obesity: A multilevel comparison. *Am J Public Health.* 2005;95:432-5.
124. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med.* 2002;346:393-403.
125. Health Canada. Action towards healthy eating-Canada's Guidelines for Healthy Eating and recommended strategies for implementation. Minister of National Health and Welfare; 1990.
127. Nova Scotia Nutrition Council. The struggle to feed our families in Nova Scotia: What does story sharing tell us? 2004.
128. McIntyre L, Glanville N, Raine K, Dayle J. Hungry mother of barely fed children: A study of the diets and food experiences of low-income lone mothers in Atlantic Canada. Capital District Health Authority, Nova Scotia.: Public Health Services; 2001. Report No.: NHRDP No. 6603- 155-002.
129. Badun C, Evers S, Hooper M. Food security and nutritional concerns of parents in an economically disadvantaged community. *J Can Diet Assoc.* 1995;56:75-80.

130. Fulkerson JA, Strauss J, Neumark-Sztainer D, Story M, Boutelle K. Correlates of psychosocial well-being among overweight adolescents: The role of the family. *J Consult Clin Psychol.* 2007;75:181-6.
131. Gable S, Chang Y, Krull J. Television watching and frequency of family meals are predictive of overweight onset and persistence in a national sample of school aged children. *J Am Diet Assoc.* 2007;107:53-61.
132. Neumark-Sztainer D, Hannan P, Story M, Croll J, Perry C. Family meal patterns: Associations with sociodemographic characteristics and improved dietary intake among adolescents. *J Am Diet Assoc.* 2003;103:317-22.
133. Neumark-Sztainer D, Wall M, Story M, Fulkerson J. Are family meal patterns associated with disordered eating behaviors among adolescents. *J Adolesc Health.* 2004;35:350-9.
134. Fulkerson J, Story M, Mellin A, Leffert N, Neumark-Sztainer D, French S. Family dinner meal frequency and adolescent development: Relationship with developmental assets and high-risk behaviours. *J Adolesc Health.* 2006;39:337-45.
135. Campbell C, Desjardins E. A model and research approach for studying the management of limited food resources by low income families. *J Nutr Educ.* 1998;21:162-71.

Appendix A
Food Management Assessment Survey
(Preliminary)

Food Management Assessment Survey

Administration Purposes Only

Family Ref. #: _____ Date of Interview: _____
Time of Interview: _____ Family Resource Center: _____
Setting for Interview: FRC _____ Home _____ Other _____

Questionnaire

I am going to start by asking you a few simple questions about **your family**.

1. How many people live in your household? _____

2. What is the age of your oldest child? _____

3. Does he/she have special dietary needs? Such as ...

Pregnant _____ Diabetes _____
Breastfeeding _____ Allergies _____
Celiac Disease _____ Other _____

4. Is he/she a fussy or picky eaters?

Yes _____
No _____ Please skip Q4b-e, and move on to Q 5

b. If yes to Q4: Do you consider this person to be a fussy/picky eater because they eat the same foods day after day? Yes _____ No _____

c. If yes to Q4: Do you consider this person to be a fussy/picky eater because special meals must be made for them? Yes _____ No _____

a. If yes to Q4c: Do you make special meals for them because of a medical reason such as allergies, celiac disease, diabetes etc?

Yes _____ No _____

d. If yes to Q4: Do you consider this person to be a fussy/picky eater because there are very few foods that they will eat? Yes _____ No _____

5A. Do you think he/she would listen to you if you tried to control or change the foods that he/she eats?

Yes _____ No _____

3M. If children have special needs: Do you have special dietary needs? Such as....

Pregnant_____ Diabetes_____Breastfeeding_____Allergies_____Celiac Disease_____
Other_____

4M. If children are fussy or picky eaters: Would you consider yourself to be a fussy or picky eater also? Yes _____ No ____

The next set of questions is going to ask you about the factors that influence the foods that **your family** eats. This includes both you and your children.

6. Please respond to each of these questions by indicating how much you agree with each statement.

On a scale from 0 to 10, with zero indicating that you strongly disagree with the statement, 5 indicating that you are undecided and 10 indicating that you strongly agree with the statement (re-read as needed throughout this question)...

a. You feel the healthfulness of food influences the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

b. Your likes and dislikes do not influence the foods choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

c. You feel your child's likes and dislikes influence the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

d. You feel that convenience influences the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

e. You feel pressure from your child's school to change the foods that you give to your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

f. You feel that peer pressure from your child's friends influences the foods choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

On a scale from 0 to 10, with zero indicating that you strongly disagree with the statement, 5 indicating that you are undecided and 10 indicating that you strongly agree with the statement...

g. You do not think ads on TV influence the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

h. Your food likes and dislikes have not changed very much since you were a teenager.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree			Agree		Undecided		Disagree			Strongly Disagree

7. Who do you feel has the most influence over the foods found in your house?

Mother	_____
Other Adult	_____
Child	_____

In the next section, I will be asking you questions about **your** food behaviours.

8. Do you usually bring a shopping list while grocery shopping for your family?

Yes	_____
No	_____

9. Do you usually use coupons or look at flyers?

Yes	_____
No	_____

10. Do you usually eat supper with your children?

Yes	_____
No	_____

11. On a scale from 0 to 10, with zero indicating that you do not know how to cook, 5 indicating average cooking skills and 10 indicating expert skills, how would you rate your cooking skills?

0	1	2	3	4	5	6	7	8	9	10
Don't know how					Average					Expert

11. On a scale from 0 to 10, with zero indicating that you do not know how to cook, 5 indicating average cooking skills and 10 indicating expert skills, how would you rate your cooking skills?

0	1	2	3	4	5	6	7	8	9	10
Don't know how					Average					Expert

12. Do you usually eat before, after or at the same time as your children?

Before _____

After _____

Same Time _____

12. Do you usually eat before, after or at the same time as your children?

Before _____

After _____

Same Time _____

12. Do you usually eat before, after or at the same time as your children?

Before _____

After _____

Same Time _____

12. Do you usually eat before, after or at the same time as your children?

Before _____

After _____

Same Time _____

Q13 is an open-end question – Interviewer checks whether the interviewee mentions the two behaviours listed below. If they do not mention late night snacking, probe further by asking if they snack late at night.

13. What times do you typically eat throughout the day?

a. 3 meals consumed _____

b. Late night snacking occurs _____

Comments: _____

13. What times do you typically eat throughout the day?

a. 3 meals consumed _____

b. Late night snacking occurs _____

Comments: _____

13. What times do you typically eat throughout the day?

a. 3 meals consumed _____

b. Late night snacking occurs _____

Comments: _____

13. What times do you typically eat throughout the day?

a. 3 meals consumed _____

b. Late night snacking occurs _____

Comments: _____

14. Who usually prepares these meals? Choose one please.

Mother	_____
Other Adult	_____
Child	_____

14. Who usually prepares these meals? Choose one please.

Mother	_____
Other Adult	_____
Child	_____

14. Who usually prepares these meals? Choose one please.

Mother	_____
Other Adult	_____
Child	_____

14. Who usually prepares these meals? Choose one please.

Mother	_____
Other Adult	_____
Child	_____

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking _____	Microwave _____
Broiling _____	BBQ _____
Deep fry _____	Boiling _____
Pan Fry _____	Slow Cooker _____
Steaming _____	Grill _____
Other, please specify _____	

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking _____	Microwave _____
Broiling _____	BBQ _____
Deep fry _____	Boiling _____
Pan Fry _____	Slow Cooker _____
Steaming _____	Grill _____
Other, please specify _____	

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking _____	Microwave _____
Broiling _____	BBQ _____
Deep fry _____	Boiling _____
Pan Fry _____	Slow Cooker _____
Steaming _____	Grill _____
Other, please specify _____	

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

15. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

The next set of questions is about **your families** eating habits. Just like before, this includes both you and your children.

16. How many times a week would your family typically eat a homemade meal?

< 7 _____
7 _____ (once a day)
7-14 _____ (about twice a day)
14-21+ _____ (about 3 times a day)

b. What is your definition of a homemade meal?

17. Does your family usually watch TV while they eat supper?

Yes _____ If yes: How many times per week _____
No _____

18. How many meals/snacks does each of your children typically eat throughout the day?

0-3 _____
>3 _____

b. Is this answer the same as Q 13? (Do not ask this question)

Yes _____
No _____

19. Do you and your family eat together as a family?

Yes, we eat together at least once everyday _____
We are able to eat together most days but not everyday _____
We eat together occasionally _____
No, we find it difficult to eat as a family _____
No, we never (or very rarely) eat together _____

Next, I will be asking you some more questions about **yourself**.

20. Which one of these eating styles describes you the best?

Grazing I eat small amounts of food throughout the day; I usually do not eat meals ____

Snacks & meals I mainly eat during mealtime, but also snack throughout the day ____

Meals only I only eat during mealtime ____

21. Do you hide or lock up certain foods in your house?

Yes ____

No ____ Skip next question

If yes to Q21: **22. Do you typically hide foods from the four food groups or do you hide “other” foods?**

Foods considered as part of the four food groups would be vegetables & fruits, grain products like bread and pasta, milk products such as cheese and milk and meat and alternatives which include nuts, beans and meats. Foods considered as part of “other” foods would be junk food, sugary drinks and foods that contain a lot of fat. (Re-read question)

Healthy Foods ____

Other Foods ____

23. Do you use any of these methods to control the snack foods that are eaten in your house?

a. Decrease the serving sizes of particular foods Yes ____ No ____

b. Decrease the frequency certain food is served Yes ____ No ____

23. Do you use any of these methods to control the foods that are eaten in your house? (Excluding snack foods)

c. Decrease the serving sizes of particular foods Yes ____ No ____

d. Decrease the frequency certain food is served Yes ____ No ____

24. Do you restrict some foods for particular members of your family?

Yes ____

No ____

The next question is an open-ended question: Interviewer will choose the category that best describes the reason for this behaviour

If respond yes to Q24: 24B. Why do you save certain foods for them?

- a. Favouritism _____
- b. Health purposes such as allergies _____
- c. To reduce conflict in the house _____
- d. Mother feels the child's needs are greater compared to the needs of other family members _____

*Is a medical/lifecycle rational provided to support this behaviour (d)? ____

25. Do you feel your family eats the same foods day after day?

Yes _____

No _____

26. Would you like to change you family's food choices?

Yes _____

No _____ Skip Q 27 & Q 28

27. Have you been trying to make these changes?

Yes _____

No _____

28. What would make it easier for you to make these changes?

29. Does anyone in your family have access to food programs other then those available through the family resource center? Examples of food programs would be a breakfast or milk program at school.

Yes _____

No _____ Skip question 29b& 30a,b,c and move on to Q31

If yes to Q 29: 29b. How many members of your family have access to these food programs? _____

If respond yes to Q29: 30. Do they use these programs?

Yes _____

No _____

If yes to Q30: 30b. How many members of your family use these programs? _____

If yes to Q30: 30c. How many members of your family do not use these programs? _____

31. In the past month, how often did you or anyone else in your household....worry that there would not be enough to eat because of lack of money?

Often _____

Sometimes _____

Never _____ Skip next two questions (end of questionnaire)

If did not respond "never" to 31a: 31b. In the past month, how often did you or anyone else in your householdnot have enough food to eat because of lack of money

Often _____

Sometimes _____

Never _____ Skip next question (end of questionnaire)

If did not respond "never" to 31b: 31c. In the past month, how often did you or anyone else in your household ...not eat the quality or variety of foods that wanted to eat because of a lack of money?

Often _____

Sometimes _____

Never _____ (end of questionnaire)

Appendix B

Ethics Application

Letter of Introduction

Informed Consent



University Research Ethics Board (UREB)

Change to Protocol Form

[Request for Approval of Modifications to Previously Approved Protocols]

A. General Information:

Name of Principal Investigator:

Kristin Joseph

Title of Research Project (title should be identical to that of any corresponding grant and/or previously approved research protocol)

Assessing the Food Management Behaviours that Influence the Diet Quality of Low-Income, Mother-led Families in Atlantic Canada

UREB File Number:

B. Description

Provide a brief description of, and explanation for, any modifications requested to your previously approved research ethics protocol. Attach responses to applicable sections (A through J) of the research ethics Review application that are affected by the proposed modifications. If these changes are to a questionnaire or interview protocol or information letter-consent form with previous ethics approval, submit the entire document and **highlight** the sections that are revised or added. A complete copy of any new measures or scales must be attached for ethics review. If necessary, please attach no more than 1 page of additional details. Applications must be typed.

The purpose of this application is to request approval to expand the sample pool of this study to include patrons of food banks and Boys and Girls Clubs located throughout Nova Scotia. This protocol change is being requested because we were unable to obtain enough participants for our study through Family Resources Centre located throughout Nova Scotia. The consent form will need to be revised to match the organizations' name and policies. The Boys and Girls Club have a policy that prohibits employees from visiting a patron's home and therefore the sentence indicating that the interview could be conducted at the interviewees' home will be deleted from the consent form.

C. Signatures:

Agreement: I/we have read the MSVU University Research Ethics Board (UREB) Instructions for Completion and Submission of Ethics Protocol Review, the MSVU Senate Policy on Ethical Conduct for Research Involving Humans, and the Tri-Council Policy Statement on the Conduct of Research Involving Humans and agree to comply with the policies and procedures outlined therein. In the case of student research, as Faculty Supervisor, my signature indicates that I have read and approved the application and proposal, deem the project valid and worthwhile, and agree to provide continuing and thorough supervision of the student(s). I/we have read and will make every effort to meet the requirements of the Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans.

For Faculty/Staff Research Projects:

Signature(s) of investigator(s):

Date:

For Students or Thesis Research Projects:

Signature(s) of student investigator(s):
Kristin Joseph

Date:
October 12, 2007

Signature(s) of Faculty Supervisor(s):

Date:

Number of copies for Submission: Minimal Risk - Please submit **two** copies of the form and pertinent attachments to the UREB Office, c/o the Research & International Office. **Exceeds Minimal Risk -** Please submit **eight** copies of the form and pertinent attachments to the UREB Office, c/o the Research & International Office.

C. Research Approach or Method

1. Describe your research method. How will you collect the data?
2. Describe/identify your participants.
3. Describe the procedure(s) for recruiting participants.
4. Outline any particular incentives you are using for participation (e.g., payment).
5. Debriefing (if applicable) - Describe debriefing procedures

1C. Research Methods

For this research, I propose to administer a 20-25 minute interviewer-administered, quantitative questionnaire to 50 participants (Rational provided in Appendix I). I will pilot test the interview with two FRC participants before I begin to interview the 50 participants whose questionnaires I will use to collect the data I will use for analysis. During the interview, I will record a pictorial and descriptive record of a typical supper meal consumed by each family member (Appendix D), and I will ask a series of close-end questions about Food Management Behaviours (Appendix B).

The purpose of the pictorial and descriptive record (item names, estimated serving size) of the family members' supper meal is to obtain enough information to assess diet quality using the Healthy Plate Score (HPS) (Appendix C). I will use data collected during this section of the interview to categorize families based on the family's average diet quality and to assess the relationship between food management behaviours and diet quality. The purpose of asking the questions relating to food management behaviours is to determine the food management

strategies used by each household. I will use data collected during this section of the interview to categorize each family based on the food management strategies they use in their household.

The children of the mothers participating in the study will be present (if possible) to provide added insight into the diet and food management behaviours used in the household. I will obtain the gender, race/culture, marital status, income range, education level and household composition of each participant using the information form (Appendix E). The purpose of the background form is to classify the participants of this research project and to ensure the participants meet the project's inclusion criteria, I will only ask this information for the purposes of this study; I will not incorporate the background form into the finalized assessment tool.

[Please Note: testimony from workers of FRCs and researchers who have worked with participants of FRCs indicate that the length of the interviews might exceed 20-25 minutes if participants voluntarily provide more information than the questionnaire requires. I (the interviewer) will not ask the participants for additional information, but if participants provide more information, I will record the information to add more depth to the final report. Before the interview begins, I will inform the participants that I will be recording all information provided during the interview.]

2C. Participants

Inclusion criteria for this research project states that all participants must be low-income, lone mothers living with at least two dependent children between the ages of 2 and 14 in Nova Scotia.

3C. Procedure for Recruiting Participants

I will select and contact individual respondents for this survey with the cooperation of FRCs, Food Banks & Boys and Girls Clubs as described below.

I will use a stratified sampling approach, to ensure the representation of lone-mothers from Aboriginal, Black, and Acadian cultures and from the Northern, Southern, Eastern and Central regions of Nova Scotia. These seven strata were selected because each stratum represents a major culture found in Nova Scotia and because there are FRCs that specifically serve these communities. Culture and traditions influence the types of food management strategies adopted by families and therefore it is important to test our tool with families from diverse cultures. I obtained a list of all the FRCs in Nova Scotia from Family Connections, an electronic directory of Nova Scotian FRCs provided by the Department of Community Services and an electronic list provided by the Department of Education. I used a combination of both electronic lists to compile the final list of FRCs for the sampling pool because neither list contained all of the FRCs currently operating the Nova Scotia (Appendix F). To ensure each FRC is currently operating, I will contact each FRC via telephone before I place it into the final sampling pool. Those FRCs that are not currently in operation will be removed from the list.

Using information obtained through Family Connections and a telephone conversation with the coordinator of Centre provincial de ressources préscolaire, I categorized the FRCs into seven strata based on the community in which they operate. Clarite LeBlanc, the coordinators of Centre provincial de ressources préscolaire was contacted directly to ensure Centre de ressources et de service à la famille- La Pirouette was the only Acadian FRC currently operating in Nova Scotia because this information could not be found on the internet. The titles of the five original strata are Northern Region, Eastern Region, Western Region, Central Region and Diversity.

The Diversity stratum contains FRCs that are either located in communities where the majority of residence (>50%) are classified as visible minorities according to data from Nova Scotia Community Counts, or cultural or ethnic priorities were specified in the center's description found online. Following analysis, four FRCs were classified into the diversity

stratum: three FRCs prioritized for Mi'Kmaq/Aboriginal peoples, one FRC was located in a predominately Black community, and one FRC prioritized for Acadian Nova Scotians. To ensure representation of each culture, one of the three Aboriginal serving FRCs will be randomly selected into our sample, and the FRC serving the Black community and the FRC serving the Acadian community will be purposely selected. Therefore, I divided the diversity stratum into three sub-strata: Black community, Aboriginal and Acadian cultures.

The remaining FRCs will be placed in one of the four regional strata. The Western Stratum, defined as FRCs located in the area from Lunenburg to Kentville, contains 16 FRCs. The Central Stratum, defined as FRCs located in the Halifax Regional Municipality, contains 14 FRCs. The Northern Stratum spans from Amherst to Canso and contains 6 FRCs, and the Eastern Stratum contains the 6 FRCs located throughout Cape Breton Island. The FRC located in Ingonish will not be included in the sampling pool because logistically it is difficult to travel to that area of Nova Scotia during the winter season, and because excluding it from the list does not excluded any Nova Scotian cultures from our sample. (Please Note: that these numbers are subject to change because the FRCs have not been contacted directly to ensure they are all still in operation)

Three of the five FRCs from the Diversity stratum will be included in the sample and two FRCs will be randomly selected from each regional stratum for inclusion in the survey. An intentions letter (Appendix G) will be sent to the 11 chosen FRC. I will make a follow-up phone call to each FRC one week after mailing the intentions letters. Each FRC that agrees to support the research project will have the option of recruiting participants by referrals made by FRC directors/coordinators, posters outlining our study (Appendix K), and/or brief talks about our study held before or after programs that individuals who meet our inclusion criteria may attend. It is not feasible to conduct random sampling at the FRC because only a select group of FRC

participants meets our inclusion criteria. Depending on the opinions of the FRCs' directors/coordinators, 50 of the FRC participants that meet our inclusion criteria will be chosen to participant in the study. I am reserving this aspect of the sampling method for the directors/coordinators of the FRCs because I would like to ensure that our methods coincide with the FRCs business and personal policies regarding this matter. For example, FRCs may have a policy against providing the names of participants without asking permission and they may not want to ask FRC participants if they would like to partake in the research project unless they can guarantee that they are able to do so.

With the help of the FRCs, I will recruit the same amount of participants from each FRC until 50 FRC participants are chosen. If any FRC is unable to provide an adequate amount of participants due to any reason, I will choose more participants from other FRC that agreed to support the research project. If I cannot make contact or gain support for the project with at least one FRC from each stratum, I will randomly select another FRC from the list of remaining FRCs found in the same stratum.

I will contact the director of the Boys and Girls Clubs in Nova Scotia and the director of some Food Banks located throughout Nova Scotia to explain the intentions of our study and to ask if they would like to participate (Appendix G). The same procedures and letters (with needed updates) (see Appendix L) used to recruit participants from Family Resources Centers will be applied to recruit participants from Food Banks and Boys and Girls Clubs with the exception of stratifying the centre according to geographical location and ethnicity. My committee and I feel that it is unnecessary to stratify the organizations because the sample does not need to be representative to validate our tool.

4C. Incentives for Participating

Each participant will receive 10\$ for participating in this research project. The purpose of the 10\$ is to relieve potential barriers of participating in the project such as childcare and transportation costs, and to compensate for the time the participants gave to participate in the research project. Therefore, participants will not benefit themselves by participating in this research project.

5C. Debriefing

Debriefing is not required for this research project because it involves no deception and minimal risk to the participants.

D. Third Party Permission

1. If you are using data provided by outside agencies, explain how you will establish agency consent.
2. If data will be collected offsite (e.g., school boards, community agencies, etc.), describe how you will establish consent of third parties. Final approval is contingent upon the researcher's formal confirmation that third party permission has been granted.

2. Data Collected Offsite

The data will be collected offsite at FRC, Food Banks & Boys and Girls Clubs located in Nova Scotia. An Intentions Letter (Appendix G), indicating who will be conducting the research, the purpose of the research, the risks and benefits for the participants, contact information, where the interviews will be conducted and the responsibilities that will be ask of the FRC workers, will be sent to each FRC that is randomly chosen from the sample pool. Dr. Lynn MacIntyre and Dr. Theresa Glanville who have a strong working relationship with FRCs and Trudy Reid, a past FRC coordinator, has approved this project and feel that FRCs would be interested in supporting the project.

If we are unable to recruit 50 participants from FRCs we will send an Intention letter (Appendix L), to the directors of Food Banks and Boys & Girls Clubs located throughout Nova

Scotia. Recruitment will not begin until the directors of the organizations agree to participate in the study.

Risks

Minimal risk is defined as: "if potential subjects can reasonably be expected to regard the probability and magnitude of possible harms implied by participation to be no greater than those encountered in everyday life."

1. Specify and describe any potential risks to participants, making special note of situations that exceed minimal risk.
2. If there is the potential to incur risk, outline the safeguards that you will put in place to protect participants.
3. Please pay special attention to situations in which the researcher may have dual relationships with participants (e.g., professors using their own students as participants; counsellors whose clients may also be their research participants).

Risks

This research project poses minimal risk to participants. The \$10 gratitude and the option of conducting the interview at the participant's home should provide compensation for time spent, and the costs associated with transportation and childcare. Privacy and anonymity procedures, as outlined in the privacy, confidentiality, anonymity section of this proposal, will protect the participant from privacy issues. A committee of nutrition, public health, and research experts will monitor all research procedures. Procedures will not commence until the University Ethics Review Board grants ethical approval. No one involved in this research project will use deception. The interviewer does not have a relationship with any participants of FRCs, Food Banks or Boys and Girls Clubs.

G. Free and Informed Consent

1. Informed Consent Forms must be placed on departmental letterhead and must address the points below.
2. Written informed consent is normally expected. If you believe written consent is impossible or unwarranted, explain why.
3. These items need to be explicit in the Informed Consent Form. These are:
 - a. The identity of the researcher(s) and contact information, and supervisor information (if applicable);
 - b. An invitation to participate;

- c. A statement of the research purpose;
 - d. A description of the tasks to be performed and the expected time commitment;
 - e. A description of foreseeable harm and benefits, including limitations to confidentiality
 - f. Confirmation that prospective participants may decline participation or withdraw at any time without penalty;
 - g. An arm's length contact in case of questions about the conduct of the research: "If you have questions about how this study is being conducted and wish to speak with someone who is not directly involved in the study, you may contact the Chair of the University Research Ethics Board (UREB) c/o MSVU Research and International Office, at 457-6350 or via e-mail at research@msvu.ca."
4. Please note that the consent of the participants shall not be conditional upon or include any statement to the effect that, by consenting, participants waive any legal rights.
 5. If participants are a captive/vulnerable population, participants must be assured that non-participation will not affect their primary care in any way. For example, students must be assured that refusing to respond to a survey will not affect them academically. When it is not clear that potential participants have the capacity to provide informed consent, or if the research participants are from a population recognized as having diminished capacity to provide informed consent (e.g. children, adults with mental disabilities), informed consent must be obtained from an individual who bears responsibility for decisions concerning the well-being of the participant (e.g. parent, guardian, care-giver). When the participant is able to provide assent for the research (i.e. express their willingness to participate at the time of conducting the research), this should also be sought.
 6. If participants are being photographed; videotaped and/or voice recorded, separate letters of consent must be attached to the Informed Consent Form.
 7. Researcher(s) should provide a description of the criteria that they will use to judge assent/dissent of a participant in the protocol that they submit for review.
 8. Parental consent is required for persons under the age of majority.
 - a. Consent of both the child and the parent(s) are required in research studies where children are minors but are 7 years or older.
 - b. With children under 7, consent of the parent(s) only is necessary for the child's participation in research.
 9. Attach the Informed Consent Form(s) to the application.

Please note that if you provide the above information in a *separate* information letter or introduction letter, it must be repeated exactly the same in the Informed Consent Form.

Describe how you will obtain Informed Consent:

I will obtain a verbal agreement from the director/coordinator of each FRC, Food bank and Boys and Girls Club who agrees to support the project (after they have read the intentions letter) before I begin to recruit participants. Each participant of the study will sign the informed consent form, which I will read to each participant before the interview begins. By signing the form, the participants will indicate that they fully understand all of the information presented in

the consent form (Appendix H & M) and give consent to be a participant of the research project. The Flesch reading ease for the consent form is 68.8 and the Flesch-Kincaid grade level is 7.0. The high readability of the consent form will ensure all participants understand the information that is being provided to them so they may make an informed decision about participating in this research project.

H. Privacy, Confidentiality, Anonymity

1. How will anonymity and/or confidentiality be maintained?
 - while collecting data (please identify situations in which confidentiality cannot be guaranteed (e.g. abuse; self-harm; etc);
 - after data collection (i.e. storage, disposal of raw data);
 - on resulting publications.
2. If you are utilizing secondary data, state its original source and confirm that the data does not allow for identification of participants.

Privacy, Confidentiality, Anonymity

To ensure privacy, the interview will be conducted in a private room at the Family Resource Center, Food Bank, Boys & Girls Club or at the participants' homes, whichever location the participant prefers. Please note that the Boys and Girls Club have a policy that prohibits employees from visiting a patron's home and therefore participants recruited through the Boys and Girls Club will not be given the option to conduct the interview at their home. Also note that some patrons and directors have asked if the interviews could be conducted in a public location such as a restaurant. To accommodate the participants I will allow the interview to be conducted at such a location to ensure the participants is given the opportunity to participate in a location that they feel is comfortable and safe.

To ensure complete confidentiality for the participants, the interviewer will not record the names of the participants. The interviewer will code each family with a reference number and each family member with a sub-reference number for administrative purposes.

The interviewer will only use written notes to document the interview. The interviewer will not use audio and visual recording methods. The interviewer will record more in depth information beyond that, which can be recorded by response options of the questionnaire. This may include comments on the readability and comprehension of survey questions, and responses that give more insight into the reasons why particular behaviours are adapted than the response options can capture.

The final report will not contain the specific names of the participants or the FRCs, Food Banks or Boys and Girls Clubs involved in the study.

I. Dissemination of Results

Describe how participants will be informed of the results of the study.

Dissemination of Results

- I will send a result letter to each of the organizations involved in the study outlining the results of the study.
- A short summary of the final report will be available to each organization involved in the study upon request. Notification of this option will be outlined in the result letter.
- If significant results are found, all FRCs and Boys and Girls Clubs located in Nova Scotia will be sent a descriptive letter about the Food Management Assessment Tool (including the Healthy Plate Score tool). The letter will indicate how community organization can access the tool for use. Only the food banks that participate in the study will be sent a letter because most food banks do not offer programs that could use such a tool.
- A final report will be developed and submitted for publication to a scientific journal.

Letter of Invitation

To Whom this May Concern:

RE: Research involvement

My name is Kristin Joseph and I am a graduate student in the Department of Applied Human Nutrition at Mount Saint Vincent University. The proposed research study is for my thesis project.

The “Hungry Mothers of Barely Feed Children” (Principal Investigator Lynn McIntyre, Co-Principal Investigator Theresa Glanville) study was conducted six years ago at Family Resource Centres located across Atlantic Canada. Last year, Meagan Sim, a graduate student at Mount Saint Vincent University re-analyzed the data and discovered that families have distinct food management strategies or rules, habits and beliefs about food. We are now developing an assessment tool based on these food management strategies that will help service providers to assess individual families based on the rules they use to manage food. Our intent is to develop a tool that it is quick to administer and does not require the interviewer to have training in diet assessment. This tool will help health workers, in particular social workers and those involved with community service organizations, to personalize the care they provide to clients.

Although we believe that food management strategies affect all families independent of income, we would like to begin to test this tool with the people that helped us discover this idea—low income mothers living in Nova Scotia. Dr. Lynn McIntyre (Researcher and MD) and Trudy Reid (Past FRC coordinator) have reviewed this research project and both support its intentions and feel it is a project that would be beneficial.

I am requesting your involvement in this study. This will consist of helping me to recruit participants by referring people that you think will be interested in participating in the study. I am looking for lone-mothers with two or more children between the ages of two and fourteen to participate in a 25-30 minute interview. Participants will complete an interviewer administered questionnaire with closed-ended questions designed to assess the foods families eat and their food rules. The questions are non-invasive and will help to categorize families. I would like to begin interviews as soon as possible.

Beyond helping me to find participants for the study, I would like to ask if I might conduct the interviews at your facility. Participants will be paid \$10 for their time, which should cover transportation to the center. I do not need to collect Social Insurance Numbers.

If you have any questions or concerns about this project or if you would like to discuss this further please contact me at [REDACTED] or email kristin.joseph@msvu.ca. Thank you for your time and your consideration of my project. I look forward to meeting you in the near future. Sincerely,

Kristin Joseph
Graduate Student
Mount Saint Vincent University

Supervisor:

Dr. N. Theresa Glanville
Supervisor/Co-Principal Investigator
Faculty of Applied Human Nutrition
Mount Saint Vincent University
Phone: 902.457.6248

Co-Principal Investigators:

Dr. N. Theresa Glanville
Supervisor/Co-Principal Investigator
Faculty of Applied Human Nutrition
Mount Saint Vincent University
Phone: 902.457.6248

Dr. Lynn MacIntyre
Co-Principal Investigator
Faculty of Medicine
University of Calgary

If you have questions about how this study is being conducted and wish to speak with someone who is not directly involved in the study, you may contact the Chair of the University Research Ethics Board (UREB) c/o MSVU Research and International Office, at 457-6350 or via e-mail at research@msvu.ca

Informed Consent

Assessing the Food Management Behaviours of Mother Led Families in Nova Scotia

Kristin Joseph, Dr. Theresa Glanville, Dr. Lynn McIntyre

My name is Kristin Joseph. I am a graduate student in the Department of Applied Human Nutrition at Mount Saint Vincent University. For my thesis project, I am conducting research under the supervision of Dr. Theresa Glanville. I am inviting you to participate in my study, Assessing the Food Management Behaviours of Mother Led Families in Nova Scotia. The Danone Institute of Canada has funded this project.

Why we are doing this project.

Many families find it hard to eat healthy. In the beginning of this project, we found that families have their own rules, habits and behaviors about eating. These rules, habits and behaviours influence the foods family members eat. The purpose of this study is to test an assessment tool we developed based on this idea.

Taking Part is quick and easy!

To take part in this study you will need to meet with me once at your “input organization” (Boys & Girls Clubs, Food Bank). At that time, I will ask you to complete a 1 hour interview. I will ask you questions and you can choose which answer describes you the best. There are no right or wrong answers. The questions will look at the foods that your family eats and the food rules used by your family. This is a new way to assess clients.

- Your participation is completely voluntary. You may withdraw from this study at any time without penalty (even in the middle of the interview).
- You will be paid \$10 for your time.
- Although there are no immediate benefits for taking part in this study, your answers will help to develop an assessment tool. In the future, healthcare workers can use this tool to personalize their care for their clients.
- The results of this project will be explained in a report that may be published in a scientific journal. To protect your privacy, we will not record your name and your identity will not be shared with anyone.

Contact us! If you have any questions or concerns about this survey or want to have a copy of the results, please contact Kristin Joseph at [REDACTED]

Thank you for your participation,

Kristin Joseph
Graduate Student
Mount Saint Vincent University
Email: kristin.joseph@msvu.ca

Dr. N Theresa Glanville

Dr. Lynn MacIntyre

Supervisor/Co-Principal Investigator
Faculty of Applied Human Nutrition
Mount Saint Vincent University
Phone: 902.457.6248
Email: theresa.glanville@msvu.ca

Co-Principal Investigator
Faculty of Medicine
University of Calgary

The University Research Ethics Board at Mount Saint Vincent University has approved this research project. If you have questions about how this study is being conducted and wish to speak with someone who is not directly involved in the study, you may contact the Chair of the University Research Ethics Board (UREB) c/o MSVU Research and International Office, at 457-6350 or via e-mail at research@msvu.ca

By signing this consent form, you are indicating that you fully understand the above information and agree to participate in this study.

Participant's signature

Date

Researcher's signature

Date

One signed copy to be kept by the researcher, one signed copy to the participant

Appendix C
Recruitment Poster

Mothers Needed!!

If you are a single mother

Living in Nova Scotia

And have at least 2 children between
the ages of 2-14

We would love to interview you

- Interview will take up to 1 hour (Average time is 30 minutes)

- You will be asked questions about the food rules that your family uses

- You can do the interview here at the Family Resource Centre or at your home, whichever you prefer

- You will be paid 10\$ for your time

If you are interested or want more information about this research project please contact Kristin Currie at

or ask the coordinator of the Family Resource Centre

Please see consent forms below for more information!

Kristin Currie

Kristin Currie

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Appendix D
List of Organizations

List of Organizations

Annapolis County Family Resource Centre Family Matters
Annapolis Valley Hants CAPC
Appletree Landing Children's Centre
Bayers/Westwood Family Support Centre
Bridgewater Family Support Centre
Cape Breton Family Resource Coalition
Centre provincial de ressources préscolaires
East Preston Day Care Family Health Resource Centre
Mi'kmaq Child Development Centre
North End Parents Resource Centre
Parent 'n Tot Meeting Place
Boy's and Girls Club: Dartmouth
Parker Street Food Bank
St. Vincent De Paul Society
Halifax West Ecumenical Food Bank
Beacon House Food Bank
Status of Woman
Dalhousie Women's Centre
School of Social Work at Dalhousie
Every Women's Centre
Halifax Coalition Against Poverty (HCAP)
Canadian Federation of Student
Phoenix House
Supportive Housing for Young Mothers (SHYM)
Community Action on Homelessness
North Shore Community Health Board
Tri County Women's Centre
Truro Learning Centre
Child Health Initiative Program (CHIP)/ Canada Prenatal Nutrition Program (CPNP)
Ann Terry Project
Whitney Pier Youth Club
Glace Bay Townhouse
Glace Bay Foodbank
Passiondale House

Appendix E
List of Family Resource Centres

List of Family Resource Centers

Annapolis County Family Resource Centre Family Matters
Annapolis Valley Hants CAPC
Appletree Landing Children's Centre
Bayers/Westwood Family Support Centre
Bridgewater Family Support Centre
Building Block Family Outreach
Cape Breton Family Resource Coalition
Chester and Area Family Resource Centre
Dartmouth Family Centre
Digby County Family Resource Centre
Eastern Shore Family Resource Association
East Preston Day Care Family Health Resource Centre
Family Resource Centre of West Hants
Family SOS
Greenwood Military Family Resource Centre
Halifax Military Family Resource Centre
Kids First Association
Kids First Family Resource Centre (Antigonish)
Kids First Family Resource Centre (Guysborough)
Kids First Family Resource Centre (New Glasgow)
Kings County Family Resource Centre
King Street Centre
Lunenburg Family Resource Centre
Maggie's Place - Colchester
Maggie's Place and Cumberland Family Support
Memory Lane Family Place Sackville Family Day Care Association
Mi'kmaq Child Development Centre
Musquodoboit Valley Family Resource Centre
New Ross Family Resource Centre
North End Parents Resource Centre
Parents And Children Together Resource Centre
Parent 'n Tot Meeting Place
Parents Place Yarmouth Family Resource Centre
Queens Family Resource Centre
Scotia Court Family Centre
Shearwater Military Family Resource Centre
Single Parent Centre

Appendix F

Final Food Management Assessment Tool

Food Management Assessment Questionnaire

I'm going to start by asking you a few simple questions about your family.

1. How many people live in your household? _____

2. How old are your children? _____

3. Are any of your children fussy or picky eaters? Yes_____ No_____
- a. Do you consider them to be a fussy/picky eater because they eat the same foods day after day? Yes_____ No_____
- b. Do you consider them to be a fussy/picky eater because special meals must be made for them? Yes_____ No_____
- c. Do you consider them to be a fussy/picky eater because there are very few foods that they will eat? Yes_____ No_____

4. Do you think your oldest child would listen to you if you tried to control or change the foods that he/she eats? Yes_____ No_____
- Do you think your _____ oldest child would listen to you if you tried to control or change the foods that he/she eats? Yes_____ No_____
- Do you think your _____ oldest child would listen to you if you tried to control or change the foods that he/she eats? Yes_____ No_____
- Do you think your _____ oldest child would listen to you if you tried to control or change the foods that he/she eats? Yes_____ No_____
- Do you think your _____ oldest child would listen to you if you tried to control or change the foods that he/she eats? Yes_____ No_____
- Do you think your youngest child would listen to you if you tried to control or change the foods that he/she eats? Yes_____ No_____
- Interviewer only: Does the mother think all of her Children would listen to her if she tried to control or change the foods that they eat? Yes_____ No_____

The next set of questions is going to ask you about the factors that influence the foods that your family eats. This includes both you and your children.

5. Please respond to each of these questions by indicating how much you agree with each statement. On a scale from 0 to 10, with zero indicating that you strongly disagree with the statement, 5 indicating that you are undecided and 10 indicating that you strongly agree with the statement....

a. You feel the healthfulness of food influences the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		

b. You feel your child's likes and dislikes influence the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		

c. You feel that convenience influences the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		

d. You do not think ads on TV influence the food choices made by your family.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		

e. Your food likes and dislikes have not changed very much since you were a teenager.

10	9	8	7	6	5	4	3	2	1	0
Strongly Agree		Agree		Undecided		Disagree		Strongly Disagree		

6. Who do you feel has the most influence over the foods found in your house?

Mother_____ Other Adult_____ Children_____

7. Does your family usually watch TV while they eat supper?

Yes_____ if yes: How many times per week_____

No _____

In the next section, I will be asking you questions about your food behaviours.

8. Do you usually use coupons or look at flyers? Yes_____ No_____

9. Do you usually eat supper with your children? Yes_____ No_____

10. On a scale from 0 to 10, with zero indicating that you do not know how to cook, 5 indicating average cooking skills and 10 indicating expert skills, how would you rate your cooking skills?

10	9	8	7	6	5	4	3	2	1	0
Expert			Average				Do Not Know How			

11. Do you usually eat before, after or at the same time as your children?

Before_____ After_____ Same Time_____

12. What times do you typically eat throughout the day?

3 meals consumed_____

Late night snacking occurs_____

Comments: _____

13. Which cooking methods have you used in the past week? Please check off all methods used.

Baking	_____	Microwave	_____
Broiling	_____	BBQ	_____
Deep fry	_____	Boiling	_____
Pan Fry	_____	Slow Cooker	_____
Steaming	_____	Grill	_____
Other, please specify _____			

14. Which one of these eating styles describes you the best?

Grazing I eat small amounts of food throughout the day; I usually do not eat meals _____

Snacks & meals I mainly eat during mealtime, but also snack throughout the day_____

Meals only I only eat during mealtime _____

15. Do you feel your family eats the same foods day after day?

Yes _____

No _____

16. Would you like to change your family's food choices?

Yes _____

No _____ if no, Skip Q16

17. Have you been trying to make these changes?

Yes _____

No _____

18. In the past month, how often did you or anyone else in your household....

a. Worry that there would not be enough to eat because of lack of money?

Often _____

Sometimes _____

Never _____ Skip next two questions (end of questionnaire)

b. Not have enough food to eat because of lack of money?

Often _____

Sometimes _____

Never _____ Skip next question (end of questionnaire)

c. Not eat the quality or variety of foods that wanted to eat because of a lack of money?

Often _____

Sometimes _____

Never _____

Appendix G
Healthy Plate Template
Healthy Plate Score

Healthy Plate Template

Beverages/Milk
& Alternatives

Vegetables & Fruit

Meat & Alternatives

Grain Products

Health Plate Score

Each “YES” response is worth 1 point for a total of 6 points.

1. Is there no more than 1 “limiting” food items? YES/NO
2. Does $\leq 30\%$ of the calories come from fat? YES/NO
3. Does the meal have 3 of the 4 major food groups present? YES/NO
4. (Yes to #3) and no more than 1 food comes from the high-fat subcategory of EWCFG? YES/NO
5. Are there more than 3 foods eaten at the meal? YES/NO
6. Is the meal home cooked? YES/NO

A complete list of the food items found in each food group can be found in Eating Well with Canada's Food guide. Get your copy on Health Canada's website http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-choix/index_e.html . Free print copies can be order by phone at 1-800-O-Canada

Health Plate Score Ratings

Score 0-2: Meal does not follow Eating Well with Canada's Food Guide (EWCFG)

Do not get discouraged. Many Canadian's find it difficult to eat healthy. Try to use the Healthy Plate Tool to think of meal ideas that follow EWCFG.

Score 3-4: Satisfactory Meal

Good Job! Can you think of some easy ways to help increase your score?

Score 5-6: Meal follows EWCFG

Congratulations! Following EWCFG will help:

1. *Meet your needs for vitamins, minerals & other nutrients*
2. *Reduce your risk of obesity, type 2 diabetes, heart disease, certain types of cancer and osteoporosis*
3. *Contribute to your overall health and vitality*

EWCFG, 2007

Appendix H
Limiting Foods Tool
Fat Estimation Tool
Determining High Fat Foods

Limiting Foods Tool

Limiting Foods are “foods and beverages high in calories, fat, sugar and/or salt (sodium)” (Eating Well with Canada's Food Guide, 2007)		
Alcohol, 1 serving	Doughnut, 1	Nachos, 2/3 reg bag (1 cup, ~20 chips)
Butter, lard or shortening, 1T	Energy drink, 1 cup	Pastry, 1 item*
Caffeinated beverage, 1 cup	French fries or onion rings, Sm (70g)	Pickled items, 1 item (1/4 cup)
Chocolate, 50g (1 bar, 2oz)	Frozen dessert, 1	Potato chips, 2/3 reg bag (1 cup, ~20 chips)
Chocolate syrup	Fruit Drink, 1 cup	Salty snacks, 1 cup
Cake, 1 piece (1/8 cake)	Granola bar, 1 bar	Soft drinks, 1 cup
Candies, 50g (1 handful or Sm bag)	Hard margarine, 1T	Sour cream, 4T (1/4 cup)
Coffee cream, 4 creamers (~1/4 cup)	Ice Cream, 1/2 cup	Sport drinks, 1 cup
Cookies, 2	Imitation cream products, 4T (1/4 c)	Sweetened hot or cold drinks, 1/2 cup
Cream cheese, Regular, 2T	Muffin, 1	Whipped cream, 2T
1 serving of alcohol = 1 beer = 1 oz liquor = 4oz wine = 1 cocktail		
*Pastry includes toaster, puff, breakfast and fast food pastries and all meat and fruit pies		
Serving sizes were developed to help evaluate a meal using the Healthy Plate Score. Serving sizes are based on calories and/or the typical serving size consumed by the general public.		

Fat Estimation Tool

Estimate the Percentage (%) of Energy from Fat		
Each serving size in the table equals 1 point. Tallying the points received for each item found in the meal. If the “Meal Score” is great than or equal to 2 estimate that greater than 30% of energy is from fat. Tip: To calculate the points received from each food item divide the amount eaten by the serving size indicated below e.g. 2 slices of bacon/3 slices of bacon = 0.67 points.		
Meat and Alternatives	Milk and Alternatives	Oils and Fats & Limiting Foods
Bacon (3 slices)	Cheese, Partly Skimmed (2oz)	Butter, lard, or shortening (2t)
Beef (11/4oz or 1/2 FG serving)	Cheese, Regular (1oz)	Cake (1piece, 65g, ~1c)
Beef, Lean (2oz)	Milk, 2%, White or Chocolate (2c)	Chips (1 cups, 2/3 Regular bag, 20 chips)
Bologna (2oz or 2 thin slices)	Milk, Whole, White or Chocolate (1c)	Chocolate Bar (1)
Burger (1)	Processed Cheese, Regular (1.5oz, 3T or 2 slices)	Cookies (2)
Canned Meat or Poultry (2.5oz)	Grain Products	Deep Fried Vegetables (Sm or 6 pieces)
Chicken Leg (1 1/3)	KD (1.5c or 1/2 box)	French Fries, Deep Fried (Sm or 20)
Chili (1c)	Biscuit (2)	French Fries, Oven Prepared (40)
Fish Cake (1)	Garlic Bread (1)	Granola Bars (2)
Fish Stick (3)	Goulash (2/3c)	Hard or Soft Margarine (2t)
Fried Egg (1.5)	Pancake (2)	Ice Cream (1/2c)
Fried Fish (2.5oz or 1 fillet)	Taco Shells (2)	Mayo, Regular (2t)
Fried Meat or Poultry (1oz)	Vegetables and Fruit	Muffin (2)
Hotdog (1)	Mashed Potato made w/ Butter/Margarine (1c)	Pie (1/8 pie or 200g)
Meat Loaf (1/4c)	Potato Salad (1/2c)	Regular Frozen Yogurt (1 2/3c)
Meat Pie (1/2 piece, 1/16 pie, or 100g)	Scallop Potatoes (1c)	Salad Dressing (2T)
Meat Sauce (1c)	Combination Foods	Sour Cream (5T)
Peanut Butter (1T)	Pizza (1/5th 12” pizza or 1 pizza pocket)	Vegetable Oil (2t)
Pork, excludes loin & chop cuts (1/2oz)		Total Points: _____ = Meal Score
Processed Meat ² , Regular (1oz)		
Sausage (1oz)		
Spare Ribs (2oz)		
Steak (3oz)		
All other meat & fish (5oz) (excludes poultry)		

² Processed meat: Includes ham, chicken nuggets, chicken fingers/tenders & luncheon meats

Determining High-Fat Foods

A Food Group food item is high in fat if the answer to any of the questions is “Yes”	
1. Is it cooked using a high fat cooking method such as deep-frying and/or pan-frying with fat?	
2. Is it made using added fat such as mashed potatoes made with butter/margarine, and salads prepared with regular* salad dressings and/or mayonnaise?	Tip: Once you answer “Yes” to a question you can stop
3. Is it made with High-Fat Milk & Alternative which includes: 1. Whole milk (liquid, evaporated & powder) 2. Regular* cheese, cheese spreads and powered imitation cheese 3. Milk products with greater than 4% M.F (includes eggnog & some yogurts)**	
4. Is it made with High-Fat Meat & Alternatives which includes: 1. Ground meats & poultry (except for lean ground) 2. Processed meats e.g. bacon, ham, sausage, luncheon meat, hotdog (except low-fat versions**) 3. Meat without fat trimmed (including skin) 4. Canned meat & poultry, and fish canned in oil 5. Fatty cuts of meat which include: 6. All dark cuts of meat (except for turkey) and all rib cuts of meat 7. All pork <u>except</u> for center cut chops, tenderloin roast and lean ground pork 8. All beef <u>except</u> cuts from round and sirloin, and stewing beef, rump roast and lean ground beef	
<i>* Regular refers to fat content ** As shown on the food label</i>	
Tip: Taco shells are deep fried	

Help with Serving Sizes and Calculating Meal Score for Estimating Fat Percentage (%)

2 Chicken nuggets = 1oz processed meat = 1 fat point

2 Meatballs = 1oz beef = 1 fat point if made with regular beef = 1/2 fat point if made with lean beef

1 Regular size bag of potato chips = 43g = 1.5 cups = 30 chips = 1.5 fat points

2 Chicken fingers/tenders = 1oz processed meat = 1 fat point

Help with Counting Items for Question 5

Piece of pizza = 1 food item

4 Pieces of pizza = 1 food item

1 Chicken leg, 2 chicken wings & 1 chicken breast = 1 food item

1 Chicken leg & 2 chicken nuggets = 1 food item

Salad = 1 food item

Cheese & crackers = 1 food item

Pizza pocket = 1 food item

Peas & Carrots (canned together) = 1 food item

Peanut butter sandwich = 1 food item

Sub sandwich = 1 food item

Lasagna = 1 food item

Spaghetti & meatballs (with tomato sauce made with added green pepper & mushrooms) = 2 food items

Canned Spaghetti & meatballs = 1 food item

Chicken salad = 1 food item