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Obesity, physical activity and lifestyle perceptions in Alberta First Nations
children

by

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Abstract

In Canada, obesity and associated chronic diseases disproportionately affect First Nations children. The objectives of this research were to assess obesity, physical activity, and perceptions of lifestyle behaviors in Cree First Nations children (5-12 years) in one Alberta reserve community. Levels of obesity (20.0%), abdominal obesity (49.5%), and physical inactivity (64.0%) were high. Most overweight and obese children were also abdominally obese (88.0%). Focus groups interviews indicated that cultural/traditional knowledge was overarching and integral to children's understandings of health, food, and activity. Discussions revealed that family members were children's main source of health knowledge. Explanations of the meaning of health included healthy foods and activities, respectful relationships with nature, and the absence of chronic conditions. Children preferred foods and activities they considered to be healthy. Our findings indicate the need to develop local strategies that integrate cultural/traditional practices and ensure family participation to promote healthy weights in First Nations children.

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List of Abbreviations

BMI: Body Mass Index

CBR: Community-Based Research

CCHS: Canadian Community Health Survey

CDC: Centers for Disease Control and Prevention

CIHR: Canadian Institutes of Health Research

IOTF: International Obesity Task Force

KSDPP: Kahnawake Schools Diabetes Prevention Program

MetS: Metabolic Syndrome

NCHS: National Center for Health Statistics

NHANES: National Health and Nutrition Examination Survey

PA: Physical Activity

RHS: First Nations Regional Health Survey

SLHDP: Sandy Lake Health and Diabetes Project

SLSDPP: Sandy Lake Schools Diabetes Prevention Program

T2D: Type 2 Diabetes Mellitus

TCPS: Tri-Council Policy Statement Draft 2nd Edition

WHO: World Health Organization

1. Introduction

Childhood obesity is a significant problem facing children across Canada (McShane, Smylie & Adomako, 2009; Shields 2006; Tremblay et al., 2010; Wang & Lobstein, 2006). There are a number of short-term consequences associated with childhood obesity such as sleep apnea, low self-esteem and asthma; however, the most severe occur when children reach adulthood (Baur, 2009; Lobstein, Baur, Uauy & IASO International Obesity Taskforce, 2004). Of greatest concern is the development of chronic diseases such as type 2 diabetes mellitus (T2D) and cardiovascular disease (Baur, 2009). In high-risk, culturally distinct pediatric populations such as Aboriginal peoples, it is particularly important to understand the prevalence of obesity and the associated factors that influence childhood obesity (Belanger-Ducharme & Tremblay, 2005; Willows, 2005a).

1.1 Who are Canada's First Nations peoples?

Aboriginal peoples are the descendants of the original inhabitants of North America (Health Canada, 2009). Three groups of Aboriginal peoples (Indian, Métis, and Inuit) are identified in the Constitution Act, each having unique heritages, languages, cultural practices and spiritual beliefs (Health Canada, 2009). *First Nations* is a non-legal term and is commonly substituted for the word Indian, which is the word used to describe an Aboriginal person who is not either Inuit or Métis (Health Canada, 2009). *Inuit* are the Aboriginal peoples in northern Canada who live above the tree line in Nunavut, the Northwest

Territories, and northern Quebec and Labrador (Health Canada, 2009). *Métis* are people of mixed Aboriginal and European descent (Health Canada, 2003).

Canada's Aboriginal population is a young population experiencing growth nearly six times greater than the rest of the population (Statistics Canada, 2008). In the 2006 Canadian Census, over one million respondents identified themselves as Aboriginal, which represents four percent of the total Canadian population (Statistics Canada, 2008). The prevalence of health problems associated with a specific population may consequently rise when that population experiences growth; for this reason it is very important to address the health issues that influence Aboriginal Canadians.

1.2 What are the pressing health issues?

Although there have been dramatic improvements in the overall health of Aboriginal peoples, their health status is poorer than that of the general Canadian population (Gracey & King, 2009; Liu et al., 2006; McShane et al., 2009; Statistics Canada, 2008). Aboriginal peoples have a shorter life expectancy as well as higher rates of suicide, infant mortality, immune disorders, and dental decay in children; they also are more likely to have infectious and communicable diseases compared to the greater population (Health Canada, 2003). Additionally, obesity disproportionately affects Canada's Aboriginal population, putting them at risk for a number of chronic diseases including T2D, cardiovascular diseases and cancer (Katzmarzyk & Herman, 2007; Kipping, Jago & Lawlor, 2008; Kuhnlein, Receveur, Soueida, & Egeland, 2004; Shields, 2006; Young, Reading,

Elias & O'Neil, 2000). Early onset T2D is of concern because the age-standardized prevalence of T2D among First Nations is three to five times that of the general population and T2D has been reported among First Nations children as young as 12 years of age (McShane et al., 2009; Young et al., 2000).

1.3 Why do these health issues exist?

The greater burden of poor health among Aboriginal peoples is largely due to the social determinants of health such as geographic isolation, poverty, single parent families, cultural barriers, jurisdictional problems and lower levels of education attainment (Bougie, 2009; Health Canada, 2009; Statistics Canada, 2008; Willows, Veugelers, Raine & Kuhle, 2009). The transition from traditional lifestyles has led to poor diets and sedentary lifestyles, which have contributed to the increase in obesity and T2D seen in the Aboriginal population (Damman, Eide & Kuhnlein, 2008; Kuhnlein et al., 2004; Willows, 2005a). Improving the health of Aboriginal peoples will depend on understanding and improving their current health, economic and social conditions (Newbold, 1998; Willows, 2005a; Young, 2003), but there has been limited research in this area to date.

1.4 Research Gaps: What needs to be learned?

In regards to the high levels of obesity among Aboriginal Canadians, much needs to be learned. For example, there have been few regional or national studies to objectively assess the weight and physical activity status of Aboriginal children. Community-based studies are required in more Aboriginal communities

to provide information about body fat and body fat distribution to establish guidelines for assessment of chronic disease risk, as well as to characterize the epidemiology for chronic diseases in this high-risk population (Kaler et al., 2006). There have been no comprehensive regional studies in Alberta and the current information available about obesity in Canadian Aboriginal peoples are made based on generalizations from a few intensely studied communities (Willows, 2005a).

Little is known about Aboriginal children's perspectives of obesity-related lifestyle choices. To our knowledge, there are no published reports of Aboriginal children who have shared their perspectives on health, food, activity or cultural foods and activities. Most of the literature documenting the health of Aboriginal peoples is epidemiologic and lacks insight into the determinants that contribute to health (Willows, 2005a; Young, 2003). Community factors can either facilitate or impede the adoption of healthy behaviours and have not been studied in Aboriginal groups (Willows, 2005a). One important unstudied factor is the relationship between culture and lifestyle practices (Willows, 2005b; Willows, Marshall, Raine & Ridley, 2009). Eliciting children's perceptions offers a unique opportunity to gain insight as to how Aboriginal children incorporate aspects of both modern and traditional/cultural lifestyle concepts into their notions of health. The research presented in this thesis is intended to address some of these research gaps.

1.5 Addressing the issues: Thesis contribution

a. Project history

This thesis is a component of the Meyo Pematchihiwin (Healthy Living) Project, which is an ongoing community-based child health project in a Cree community in Alberta. The First Nations Cree community is located in Treaty 6, 65km northwest of a major city. The overall purpose of the project is to conduct a formative needs assessment to inform the development of a T2D prevention strategy for children and families living in the community. A Band Council Resolution supports the project and the research is guided by a steering community (Wisdom Committee) comprised of community members (elders and parents), community department representatives, university researchers and health professionals and educators working in the community. The University of Alberta researchers have a research agreement with the community as recommended by the CIHR Guidelines for Health Research Involving Aboriginal People (Canadian Institutes of Health Research, 2007). This project has also been approved by the University of Alberta's Health Research Ethics Board (Panel B).

b. Thesis research objectives

The research described in this thesis is designed to address some of the aforementioned research gaps. Using an explanatory sequential mixed methods approach, research for this thesis was divided into two distinct phases: quantitative followed by qualitative (Creswell & Plano Clark, 2007). In the quantitative phase of the study, objective measures were used to determine

obesity prevalence and physical activity levels of children attending the community school. The qualitative phase of the study used focus groups to elicit children's perceptions related to obesity-related lifestyle behaviours (e.g., food and physical activity). It was intended that the information provided by the qualitative research would contextualize the results of the quantitative findings. Together, these complementary approaches were used to create a profile of the First Nations children living in this community. The contribution of this thesis is substantial. The information provided by this research will contribute to the design of effective strategies to prevent the development of obesity and T2D among Aboriginal children in this community.

Study One: Quantitative Health Assessment

A school-based assessment of Cree children was completed to:

- examine the prevalence of overweight and obesity
- determine the prevalence of abdominal obesity
- assess physical activity levels

Study Two: Qualitative Exploration of Children's Perceptions

Focus groups were used to assess children's:

- traditional knowledge, and the influence of culture on children's perceptions
- perceptions about healthy foods and activities
- food and activity preferences

To ensure community relevance, both phases of this research were developed to provide insight into local factors that may contribute to childhood obesity. The resultant information from this research will be combined with existing community knowledge and resources to develop culturally appropriate, community specific obesity and T2D prevention strategies. On a broader scale, few studies have simultaneously documented Aboriginal children's health status, explored health perceptions of First Nations children and given children a voice to inform community health directives. Therefore, the information collected for this thesis will be instrumental to the development of culturally relative interventions to prevent obesity in Cree First Nations children.

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2. Literature Review

This narrative literature review uses key sources to provide the information required to effectively situate this study within the greater research context (Green, Johnson & Adams, 2006). A narrative review was chosen because it provided a broad overview of the topic area and described the development of the problem (Green, Johnson & Adams, 2006). This literature review is divided into three sections, each discussing key findings, methodological considerations, and gaps in the body of knowledge related to the topic of the section. First, an overview of pediatric obesity is discussed with a focus on Canadian First Nations. Second, community-based research is defined and discussed as a research approach with First Nations communities. Lastly, research with children is discussed and moral, ethical and methodological issues are identified.

2.1 Childhood obesity overview: A focus on Canadian First Nations children

a. Definitions and measurement techniques

i. *Adiposity, overweight and obesity*

Adiposity, overweight and obesity are terms that have been used interchangeably in research, but the terms are distinct and have slightly different meanings. *Adiposity* refers to fat mass, which functions as insulation and serves as an energy reserve as well as a storage depot for vital nutrients (Egger & Dixon, 2009). Adipose cells synthesize and secrete hundreds of vital proteins that influence appetite and satiety, glucose and lipid metabolism, blood pressure

regulation, inflammation and immune functions (Redinger, 2009). These functions are necessary for good health; however, excessive fat stores, particularly visceral fat deposits, have been associated with adverse health conditions and chronic disease (Berg & Scherer, 2005; Egger & Dixon, 2009; Haslam & James, 2005; Ravussin & Smith, 2002). *Overweight* and *obesity* correspond to degrees of total body fatness that tend to lead to increased health risks (Hubbard, 2000). *Overweight* refers to a degree of adiposity that places a person at an *increasing* risk of developing health problems, where as *obesity* refers to a degree of adiposity that places a person at a *high* risk of developing health problems (Health Canada, 2003a; Raine, 2004; World Health Organization, 2000). Advanced methods are available to measure adiposity and body composition (e.g., dual energy x-ray absorptiometry, magnetic resonance imaging), but these techniques are impractical for epidemiological and clinical use due to cost, limited access and operator training requirements. Anthropometric measures and derived indices (e.g., body mass index [BMI] and waist circumference) are the most practical tools to evaluate weight status in children since they are simple, easy to use, and inexpensive (Parizkova & Hills, 2005; Pi-Sunyer, 2000).

ii. *Body mass index (BMI)*

The BMI is a general measure of adiposity (Nevill, Stewart, Olds & Holder, 2006) and is calculated by dividing weight (kilograms) by height (metres²) (Dietz & Bellizzi, 1999). One commonly cited limitation of the BMI is its inability to distinguish between lean and fat mass compartments (Eto, Komiya, Nakao & Kikkawa, 2004); however, BMI is strongly and positively correlated

with other objective measures of obesity (e.g., dual-energy X-ray absorptiometry and skinfold thickness) as well as risk factors for cardiovascular disease and type 2 diabetes (e.g., high blood pressure, dyslipidemia, insulin resistance) (Frontini, Bao, Elkasabany, Srinivasan, & Berenson, 2001; Parizkova & Hills, 2005).

There has been some criticism regarding the use BMI as a measure of obesity for First Nations peoples. Total body fat mass and fat distribution patterns can differ among ethnic groups (Lear, Humphries, Frohlich & Birmingham, 2007; Lear, Kohli, Bondy, Tchernof & Sniderman, 2009). It has also been shown that some First Nations people have a greater proportion of abdominal fat compared to Caucasians, a distinction that is not captured by BMI (Lohman et al., 2000; Potvin et al., 1999; Young, Reading, Elias, & O'Neil, 2000). Additionally, estimates of body fat based on BMI reference data may underestimate obesity in First Nations populations (Potvin et al., 1999; Lohman et al., 2000; Young et al., 2000). One of the few studies to examine this phenomenon found that BMI underestimated body fat percentage in Canadian Aboriginal peoples compared to Europeans; however, the findings were not statistically significant (Lear et al., 2007). For these reasons, BMI is generally considered to be only a rough estimate of total body fat and health risk associated with adiposity. Despite its shortcoming, validation and support for the use of BMI with children and adolescents is widespread and can be used to describe levels of adiposity in population studies (Dietz & Bellizzi, 1999; Dietitians of Canada et al., 2004; Hall & Cole, 2006).

iii. BMI growth charts to assess overweight and obesity

Since the initial development of BMI charts for children and youth in the early 1980's (Roland-Cachera et al., 1982) a number of developmental BMI curves have been produced (Parizkova & Hills, 2005). Universal agreement has not been reached on which BMI growth cut-off values are the most appropriate to classify children as overweight and obese (Neovius, Linne, Barkeling & Rossner, 2004). Discrepancies among classification systems can result in differing prevalence reports of overweight and obesity within a population (Flegal, Ogden, Wei, Kuczmarski & Johnson, 2001; Willows, Johnson & Ball, 2007). One study of Canadian First Nations preschool children found that two different references provided significantly different results, making it important to identify and understand the limitations of the cut-off values used and to use caution when making comparisons of obesity prevalence across studies (Willows et al., 2007). Presently, there are three BMI weight references that have elicited international discussion and may be useful for application among First Nations children living in Canada.

Centers for Disease Control and Prevention (CDC)

The Centers for Disease Control and Prevention (CDC) 1977 CDC charts based on National Center for Health Statistics (NCHS) data were revised and replaced in 2000 with the 2000 CDC reference (Kuczmarski et al., 2000). Data from the National Health and Nutrition Examination Survey (NHANES) II and NHANES III supplied information to generate the 2000 CDC growth reference charts (Kuczmarski et al., 2000). The 2000 CDC chart series includes age and sex

related BMI information for males and females (2 – 20 years of age), and includes cutoffs at the 85th and 95th percentiles to define overweight and obese, respectively (Kuczmarski et al., 2000).

International Obesity Task Force (IOTF)

The International Obesity Task Force (IOTF) developed a growth reference using data from a large multinational (Brazil, Great Britain, Hong Kong, Netherlands, Singapore, USA) dataset (Cole, Bellizzi, Flegal, & Dietz, 2000). The reference was developed for children from ages 2-18 (Cole et al., 2000), and BMI cutoffs for overweight and obesity were extrapolated from the widely accepted adult BMI obesity cutoff points for *normal weight* ($BMI < 25\text{kg/m}^2$), *overweight* ($25\text{kg/m}^2 \leq BMI < 30\text{kg/m}^2$) and *obese* ($BMI \geq 30\text{kg/m}^2$) (Cole et al., 2000; Dietitians of Canada et al., 2004). These charts were developed to enable international comparisons of prevalence levels for overweight and obesity (Cole et al., 2000).

World Health Organization (WHO)

The World Health Organization (WHO) has two types of growth charts available for children; a growth standard for children birth to five years old and a growth reference for children five to nineteen years old (Dietitians of Canada, Canadian Paediatric Society, The College of Family Physicians of Canada & Community Health Nurses of Canada, 2010). A growth standard conveys healthy growth for a population and a growth reference describe growth in respect to a sample population (Dietitians of Canada et al., 2010). The WHO Child Growth Standards (birth to five years old) resulted from the Multicentre Growth

Reference Study, which examined healthy, optimally fed, free of disease children from a number of countries including Brazil, Ghana, India, Oman, Norway and the United States (de Onis, Garza, Victora, Bhan & Normun, 2004; Fenn & Penny, 2008; WHO Multicentre Growth Reference Study Group, 2006). The WHO Reference 2007 is a reconstruction of the WHO endorsed 1977 NCHS growth reference for children 5 to 19 years (Butte & Garza, 2006; Butte, Carza & de Onis, 2006; de Onis, Onyango, Borghi, Siyam, Nishida, Siekmann, 2007). Both the WHO Child Growth Standards and WHO Reference 2007 were intended to provide internationally acceptable growth charts and have been recommended for use among Canadian children in clinical, community and research settings (Dietitians of Canada et al., 2010).

iv. Abdominal obesity and waist circumference measures

Waist circumference is a measure of abdominal obesity that correlates with visceral adipose tissue and acts as a predictive measure for the development of chronic diseases in both children and adults (Alberti, Zimmet & Shaw, 2005; Katzmarzyk & Herman, 2007; Liu et al., 2007; Maffeis, Pietrobelli, Grezzani, Provera & Tato, 2001; Mason & Katzmarzyk, 2009; Pischon et al., 2008). Waist circumference has been advocated as a supplementary measure to BMI for measuring body size in children and adolescents (World Health Organization, 2000) because it provides a straightforward, simple measure of fat distribution that does not involve a calculation to evaluate and interpret the health risks associated with obesity (Ardern, Katzmarzyk, Janssen & Ross, 2003; Daniels, Khoury & Morrison, 2000). The use of waist circumference to assess obesity-

related health risk is particularly relevant for Aboriginal peoples who tend to have high waist-to-hip ratios and store fat more centrally than Caucasians (Harris et al., 1997; Lohman et al., 2000; Potvin et al., 1999).

Unfortunately, there are no internationally accepted references available to assess waist circumference status among children (Johnson et al., 2010). In Canada, percentile references have been developed for youth between 11-18 years old using data from the 1981 Canada Fitness Survey (Katzmarzyk, 2004). Also, in the United States, percentiles were developed for children and adolescents from 2-18 years using NHANES III data (Fernandez, Redden, Pietrobelli & Allison, 2004). To date, waist circumference references have not been developed for First Nations children; however, there is insufficient evidence to suggest that population specific waist circumference reference cut-offs need to be developed for Aboriginal peoples (Lear, James, Ko & Kumanyika, 2010).

There is also no universally accepted measurement protocol to describe the most effective measurement location to assess waist circumference and associated health risks for children. While adult studies have assessed associations between waist circumference measurement locations and metabolic risk factors (Mason & Katzmarzyk, 2009; Wang et al., 2003; Willis et al., 2007) there has only been one study among children (Johnson et al., 2010). This study reported variation between waist circumference measurement sites in overweight children and recommended the use of two locations; the narrowest waist and the midpoint between the floating rib and iliac crest (Johnson et al., 2010). These findings are important because existing guidelines, for example the NHANES

Anthropometry Procedures Manual (2004), recommends measuring waist circumference at the site of the iliac crest, which is not the most effective site to assess obesity-related health risk in overweight children (Johnson et al., 2010). Thus, it is important to establish a standard protocol to measure waist circumference in children, in order to appropriately assess the associated health risks and to make comparisons across studies.

v. *Physical activity (PA)*

Physical activity (PA) can be defined as bodily movements that result in increased energy expenditure (LaMonte, Blair, & Church, 2005). Research illustrates that PA plays an important role in reducing, preventing and treating obesity and obesity-related co-morbidities by increasing high-density lipoprotein cholesterol and decreasing visceral fat accumulation, triglycerides, and blood pressure (Dunton, Kaplan, Wolch, Jerrett & Reynolds 2009; Katzmarzyk & Herman, 2007; Liu et al., 2006a; 2006b). While evidence suggests that PA is an important protective factor against obesity among Canadian children (Tremblay & Willms, 2000; Tremblay et al., 2010), few studies to date have replicated this observation in non-Caucasian ethnic groups such as First Nations children (Katzmarzyk, 2008; Katzmarzyk & Herman, 2007; Liu et al., 2006a; 2006b; Pigford & Willows, *In Press*; Willows, 2005).

There are a number of important considerations to make when assessing PA in children. Researchers have only recently begun to measure PA in all populations (J. Hill, 2006) and there are many gaps in the knowledge. Little is known about how socio-cultural and ecological determinants influence children's

PA patterns, therefore future research is required (Bryan & Walsh, 2004; Willows, 2005). Presently, there are no surveillance systems in place to monitor PA levels among Canadian children (Bryan & Walsh, 2004). This may be in part because PA is difficult to measure and a limited variety of techniques are available (Salmon & Okely, 2009). Questionnaire-based assessments of PA are the most common subjective method to assess energy expenditure, and can be imprecise, particularly in children (Brown, Hume & ChinAPaw, 2009). This is because self-report methods (e.g., questionnaires) are considered to be unreliable in children 11 years old or younger (Brage et al., 2004). Instead, objective measures using activity monitors (e.g., heart rate monitors, global positioning systems, pedometers and accelerometers) are recommended for pediatric use, yet there are also inherent problems with each of these methods (Salmon & Okely, 2009). Therefore, to effectively assess PA among First Nations children it is important to utilize a method that collects objectively measured PA data.

vi. Physical activity assessment: Pedometers

Pedometers are simple, low cost instruments that measure PA as the total number of steps taken in a specific time period (McClain & Tudor-Locke, 2009; Tudor-Locke, McClain, Hart, Sisson & Washington, 2009). To measure the number of steps taken, a pedometer is mounted at the waist, and detects each step by using a horizontal, spring-suspended lever arm that moves up and down with vertical accelerations of the hip (Dietz, 1998; McClain & Tudor-Locke, 2009). Guidelines have been established and validated for use in children aged 6-12 years, for the minimum number of steps recommended per day, based on an

optimal step count derived from daily PA recommendations and normal BMI values (McClain & Tudor-Locke, 2009; Tudor-Locke et al., 2004; Tudor-Locke et al., 2009). Because energy requirements and levels of PA vary depending on age and sex (Bryan & Walsh, 2004), to maintain a healthy body weight females (6-12 years) are recommended to take more than 12,000 steps/day and males (6-12 years) more than 15,000 steps/day (Tudor-Locke et al., 2004). In addition to daily step recommendations, schematic activity zones have been developed to motivate children to increase their daily step counts and resultant PA (Tudor-Locke, Hatano, Pangrazi, & Kang, 2008). Finally, to determine habitual PA previous recommendations have suggested that four days of pedometer monitoring is appropriate; however, a recent analysis of existing studies determined that two to eight days of pedometer data is sufficient (Tudor-Locke et al., 2009). This means that pedometers permit researchers to objectively assess children's habitual PA in as few as two days.

There are several limitations associated with pedometer use to measure PA in children. A pedometer does not measure the intensity or type of activity done to accumulate the total step count, which limits the assumptions that can be made about a child's fitness level (Tudor-Locke, William, Reis & Pluto, 2002). Additionally, pedometers are most sensitive to ambulatory activities such as walking or running and are less able to record activities such as bicycling or skating (Mitre, Lanningham-Foster, & Levine et, 2009). This means that the number of steps recorded by the pedometer may not be representative of the total PA. There are also concerns about using pedometers for obese pediatric

populations because abdominal obesity may cause tilting or inappropriate placement of the device or dampening of the force of vertical accelerations (Mitre et al., 2009; Tudor-Locke, Ainsworth, Thompson, & Matthews, 2002). Therefore the pedometer may not be an appropriate tool to assess and promote PA among obese children. While it is important to consider these limitations, pedometers are one of the most simple, effective, and objective tools currently available to measure total PA.

vii. Conclusions

Recommendations for population wide periodic monitoring of weight status highlight the importance of using comparable definitions and appropriate surveillance tools (Misra & Khurana, 2008). BMI-for-age growth charts are currently the best available tool to monitor and assess child growth and obesity prevalence (Hall & Cole, 2006). To monitor obesity prevalence over time and across populations requires the use of a consistent growth reference or standard (Edwards, Evans, & Brown, 2008; Willows et al., 2007). In Canada, Cole et al.'s (2000) international BMI thresholds were recommended to assess obesity prevalence for population studies (Dietitians of Canada et al., 2004); however, these recommendations have changed since the time of this study to support cutoffs for the WHO Child Growth Standard and the WHO Reference 2007 (Dietitians of Canada et al., 2010). Waist circumference is recommended as a supplemental measure to BMI and is useful in predicting relative risk for chronic disease (Janssen, Katzmarzyk & Ross, 2004). Additionally, physical inactivity is thought to have increased health consequences for the Aboriginal population

(Garriguet, 2008) making it important to gather information about PA among First Nations children using objective measures.

b. Overweight and obesity prevalence among First Nations children

i. National obesity prevalence studies

To date, two national studies have explored pediatric obesity in Canada's First Nations pediatric population. The 2004 Canadian Community Health Survey (CCHS) collected measured height and weight data, and reported a combined total of 41% overweight and obese in off-reserve Canadian Aboriginal (First Nations, Inuit and Metis) children (Shields, 2006). The obesity prevalence for Aboriginal children was more than two times the national average (20.0% *versus* 8.2%, respectively) (Shields, 2006). Using parent-reported data, the First Nations Regional Longitudinal Health Survey (RHS) 2002 – 2003 surveyed First Nations children living on-reserve and revealed that 36.2% of boys and girls were obese and 22.3% were overweight suggesting that on-reserve children might be at increased health risk compared to their off-reserve peers (RHS National Team, 2007). The discrepancy between the 2004 CCHS data and the 2002-2003 RHS data may be a result of a reporting bias; parent-reported data tends to underestimate children's height which may overestimate overweight and obesity prevalence (Shields, 2006). Therefore, it is important to assess overweight and obesity among on-reserve First Nations children using measured data.

ii. Obesity-related studies in First Nations communities

James Bay Cree

There are 14,000 Cree First Nations living in northern Quebec in nine rural or remote communities in the James Bay region. Cree children living in the region 60 years ago had healthy body weights with only two percent being obese (Ngnie, 2002). However, more recent trends indicate a substantial increase in the number of children and youth with unhealthy weights. In 2004-2005, 43.8% of children in grades four to six were obese, while 23.6% were overweight (IOTF criteria), and 55.2% of children were abdominally obese according to waist circumference measurements (Downs, Marshall, Ng, & Willows, 2008). The high levels of obesity and abdominal obesity found among these children are concerning because they place children at increased health risk.

Studies in the James Bay region have assessed nutrition, health behaviours, diabetes awareness and body image among children (Downs et al., 2008; Downs, Arnold, Marshall, McCargar, Raine & Willows, 2009; Willows, Marshall, Raine & Ridley, 2009). Nutritionally, Cree First Nations children had energy dense diets with high consumption of sweetened beverages and snack foods, and low consumption of nutrient rich foods (Downs et al., 2009). Children also had low levels of PA and fitness (Downs et al., 2008; Downs et al., 2009). The combination of a poor diet and low PA and fitness levels indicate the need to develop strategies to improve Cree children's dietary and PA practices. Two additional studies have assessed other factors that contribute to childhood obesity, concluding that community and cultural preferences for a larger body size may

influence Cree children's perceptions of healthy body size, and that few (27.6%) children knew what diabetes is, suggesting that children may not be aware of the consequences of obesity (Willows et al., 2009). A community-based study that seeks to apply an ecological approach to understand nutrition and health is underway in one James Bay community to further contextualize these findings. Together, the studies in the James Bay region suggest the need to develop community specific, culturally-relevant approaches which build on existing knowledge to address First Nations childhood obesity.

Sandy Lake First Nation

Sandy Lake First Nation is a remote Ojibway-Cree community of approximately 2000 people located in Ontario, isolated by boreal forest. Overweight and obesity in children is common in this community; approximately 30% of boys and girls (2-19 years old) are overweight; and the youngest age categories (2-5 years old) represented the highest prevalence of overweight (45.2% of girls and 34.6% of boys) (Hanley, Harris, Gittelsohn, Wolever, Saksvig & Zinman, 2000). Body size in childhood is likely to carry into overweight and obesity in adulthood. In children aged 10 -19 years, energy intake was not associated with obesity; however, overweight children watched more television, had a lower fitness level and consumed less fiber than children who were not overweight (Hanley et al., 2000), indicating that it is important to assess lifestyle factors associated with childhood obesity.

To address the high prevalence of overweight and obesity, the Sandy Lake Health and Diabetes Project (SLHDP) was developed in 1993 (Harris et al., 1997;

www.sandylakediabetes.com). The SLHDP was a community-based intervention program that used a comprehensive approach, which incorporated: radio programming to highlight healthy lifestyle activities; a strategy at the local grocery store about healthy food labeling; home visits to promote healthy food preparation; emphasis on participation in community events; and the development of walking clubs and walking trails (Saksvig, et al., 2005; www.sandylakediabetes.com). To supplement the SLHDP, the Sandy Lake School Diabetes Prevention Program (SLSDPP), a culturally appropriate curriculum program was developed for students in grades, three, four, and five (Saksvig et al., 2005). The curriculum focused on knowledge and skills development related to healthy eating, PA, and diabetes education; a family component informed parents about the healthy eating and PA messages their children were learning in school; peers were trained to act as role models; and an environmental component included a healthy school lunch program as well as a school-wide policy that banned high-fat and high-sugar snack food (Saksvig et al., 2005).

The program evaluation of the SLSDPP illustrated improvements in dietary intention, dietary preference, dietary self-efficacy and improved knowledge among children (Saksvig et al., 2005). This study did not find a reduction in obesity in the children considering mean BMI and body fat percentage increased during the intervention period (Saksvig et al., 2005). While the program was not successful in reducing obesity, the curriculum is still taught in Sandy Lake because of the improvements in knowledge, dietary self-efficacy,

and diet (Saksvig et al., 2005). In summary, the SLSDPP demonstrates that a culturally-appropriate, school-based intervention can increase knowledge, skills, self efficacy, and positively influence lifestyle behaviours among First Nations' students.

Kawawake

Kawawake is an urban Mohawk community near Montreal, Quebec. In 1994, the Kahnawake Schools Diabetes Prevention Project (KSDPP) was initiated becoming the first primary prevention program for T2D in a First Nations community (Adams, 2005; Montour, 2001; Teufel & Ritenbaugh, 1998). The project sought to reduce childhood obesity and the development of T2D by utilizing a community-based approach (Adams, 2005; Bisset, Cargo, Dleormier, Maculay & Potvin, 2004; Paradis et al., 2005). There was a high rate of obesity and T2D among adults living in Kahnawake and prevalence data has revealed that 31% of Kanawake children aged six to eleven were overweight (NHANES II $\geq 85^{\text{th}}$ percentile) and skinfolds indicate that excess weight was centrally distributed in children (Potvin et al., 1999). Studies showed that among children television viewing and other sedentary activities were related to body fat and that high-energy foods high in sugar were commonly consumed (Horn, Paradis, Potvin, Macaulay & Desrosiers, 2001; Trifonopoulos, Kuhnlein, & Receveur, 1998) highlighting the need to support and promote lifestyle changes among these children.

The KSDPP was a community-based research intervention that adopted an ecological approach to promote healthy weights (Adams, 2005; Bisset et al.,

2004; Paradis et al., 2005). The intervention combined social learning theory, the PRECEDE-PROCEED model, the Ottawa Charter for Health Promotion, and traditional learning styles, as well as collaborations within community organizations (Paradis et al., 2005). The KSDPP developed a health education curriculum that was reinforced by additional initiatives such as, offering a healthy breakfast at the school, the creation of a community garden, the promotion of healthy eating and activity to the community through local radio programs and the local paper (Teufel & Ritenbaugh, 1998). Importantly, the KSDPP utilized a participatory approach and there was a strong sense of involvement, ownership and decision making by the community (Paradis et al., 2005).

Both cross-sectional and longitudinal evaluations of the KSDPP have revealed that there was no apparent reduction in obesity (Adams, 2005; Paradis et al., 2005). While children were making healthier choices (decreased TV watching and increased PA) and illustrated increased knowledge and self-efficacy after the intervention, there were no changes to BMI or diet (Paradis et al., 2005). Nonetheless, the intervention was successful in shifting the perception of diabetes from a problem to live with to a problem that can be prevented (Bisset et al., 2004). Thus, while the KSDPP was not successful in directly reducing childhood obesity, it provided a real life example of how to conduct a community-based strategy to improve children's choices associated with healthy lifestyles and improved diabetes awareness.

Tsimshian Nation

The Tsimshian Nation consists of three remote coastal communities in British Columbia with a total population of approximately 1000 to 1400 people. This study is one of the first studies to describe the prevalence of obesity, and related health risks among First Nations children living in western Canada (Zorzi, Wahi, Macnab & Panagiotopoulos, 2009). Of Tsimshian First Nations children aged 6-18 years, 19% were overweight and 26% were obese (IOTF criteria) (Zorzi et al., 2009). Additionally, 36% of participants were abdominally obese and 4.7% of children were considered to have the metabolic syndrome (Zorzi et al., 2009). These findings suggest that First Nations children in western Canada experience similar obesity prevalence and obesity-related health risks to their peers in central Canada. For this reason, it is important to develop appropriate strategies to promote healthy lifestyles in First Nations communities across the country and to conduct more research, particularly in western Canada about children's lifestyle practices.

c. Short- and long-term health consequences of childhood obesity

There are many short- and long-term consequences that can occur as a result of childhood obesity (Baur, 2009; Daniels, 2006; Lobstein, Baur, Uauy & IASO International Obesity Taskforce, 2004). These consequences include physical manifestations such as chronic diseases, as well as the manifestation of psychosocial issues such as, stigma, low self-esteem, body dissatisfaction etc... The following section provides an overview of these issues as related to childhood obesity in First Nations children.

i. Chronic disease development: A focus on type 2 diabetes (T2D)

Children experience the immediate consequences of being obese in the form of hypertension, dyslipidemia, skeletal abnormalities, nonalcoholic fatty liver disease, sleep apnea, and decreased insulin sensitivity (Cruz, 2006; Daniels, 2006; Kiess et al., 2006). It has been long recognized that obese children tend to become obese adults (Serdula et al., 1993). Childhood obesity increases the risk of developing chronic diseases and the risk for morbidity in adulthood (Blair & Bordney, 1999; Daniels, 2006; Pischon et al., 2008). Metabolic disorders associated with adult obesity include the metabolic syndrome, insulin resistance, dyslipidemia, cardiovascular disease and T2D (Klein et al., 2004). Historically, the full effects of these disorders have not manifested until adulthood; however, these chronic conditions are now being seen in young children (Daniels, 2006).

The metabolic syndrome (e.g., abdominal obesity, hypertension, hyperinsulinemia and dyslipidemia) predicts T2D later in life (Hanley et al., 2000). T2D occurs when insulin secretion is inadequate to meet the increased demand posed by insulin resistance and has many negative health consequences (e.g., hypertension, nephropathy, and retinopathy) (Druet et al., 2006; Pinhas-Hamiel & Zeitler, 2007). The prevalence of T2D has increased dramatically in children and adolescents in parallel with the increasing incidence of obesity (Rosenbloom, Silverstein, Amemiya, Zeitler & Klingensmith, 2009) and excess fat mass is likely the single-most important cause of insulin resistance and T2D (Terán-García & Bouchard, 2007). The health consequences associated with

childhood obesity and T2D create a heavy health care burden for Canadians, and this is particularly true for Aboriginal groups, which suggests prevention programs are necessary (Birmingham, Muller, Palepu, Spinelli, & Anis, 1999; Sheilds, 2006).

The Canadian Aboriginal population has very high rates of T2D as compared to non-Aboriginals (Young et al., 2000). First Nations adult groups have a two to five times higher prevalence of T2D compared to the general population (Oster & Toth, 2009; Kaler et al., 2006). There have been dramatic increases in the prevalence of T2D adult Aboriginal populations across Canada (Retnakaran, Hanley, Connelly, Harris, & Zinman, 2006). Increases have been documented in the Sioux Lookout Zone of northwestern Ontario where the prevalence increased by 45% between 1984 and 1994 (Fox, Harris & Whalen-Brough, 1994) and in Saskatchewan, where the prevalence doubled between 1980 and 1990 (Pioro Dyck, & Gillis, 1996). The Oji-Cree of Sandy Lake in northern Ontario have a one of the highest T2D prevalence's in the world (Harris et al., 1997; Dean, Sellers & Young, 2003). The first data available for Western Cree are consistent with prevalence reports elsewhere in Canada suggesting that T2D is an increasing problem for First Nations people across the country (Kaler et al., 2006).

The manifestation of T2D in childhood was first acknowledged in American Indian and First Nations populations in the late 1970's and early 1980's, suggesting that Aboriginals are particularly susceptible to the disease at a young age (Fagot-Campagna, 2000). One in every five Cree adults in the James

Bay Quebec region over the age of 20 years has T2D and almost half of Cree living with T2D are diagnosed before 40 years of age (Kuzmina et al., 2008; Willows et al., 2009). The time course for T2D can be accelerated and in some children at high risk it can develop in just a few years whereas in adults it can take decades (Goran, Ball & Cruz, 2003; Rosenbloom et al., 2009). Components of the metabolic syndrome have been shown in non-Aboriginal children as young as eight years of age making them susceptible to the development of T2D (Froberg & Andersen, 2005). T2D has been diagnosed in First Nations children as children as young as eight years old in northern Manitoba (Dean, Young, Flett & Wood-Steiman, 1998) and high levels of obesity, pre-diabetes and metabolic syndrome are commonly found in First Nations peoples less than 18 years of age (Kaler et al., 2006; Zorzi et al., 2009). Therefore, it is crucial to address the high prevalence of obesity-related health consequences by promoting healthy weights among First Nations children.

ii. Psychosocial development: Cultural contributions

A number of psychosocial issues with both immediate and long-term effects have been linked with childhood obesity. For example, depression and a low quality of life are linked to body dissatisfaction associated with obesity (Neumark-Sztainer, Wall, Eisenberg, Story & Hannan, 2006). Elevated levels of depression are commonly found in youth seeking medical treatment for obesity (Dreyer & Egan, 2008). In one clinical study, more than half of obese adolescents had a clinical diagnosis often involving a major depressive disorder (Eremis, Cetin, Tamar, Bukusoglu, Akdeniz & Goksen, 2004). Overweight adolescents

who have been teased by peers or family members reported increased suicidal thoughts and attempts (Eisenberg, Neumark-Sztainer & Story, 2003). In general, obese children report a significantly lower health-related quality of life than their normal weight peers and are five times more likely to have impaired quality of life (Conroy, Ellis, Murray & Chaw-Kant, 2007). While there are many important clinical, family and school-based implications for these findings in the direct treatment of childhood obesity (Dreyer & Egan, 2008), this information is also useful to consider at the community level. Future research is needed to understand the social and cultural contexts that influence the development of psychosocial conditions in overweight and obese children.

Little is known about how culture influences the psychosocial effects associated with obesity in First Nations children. Culture is a system of shared ideas, concepts, rules and meanings that underlie the way that human beings live (Keesing & Strathern, 1997) and is very important when considering the impact of obesity on psychosocial concerns and weight control behaviours (Neumark-Sztainer, Story, Resnick & Blum, 1997; Davis & Lambert, 2000). In the United States, many American Indian children have expressed body size dissatisfaction and concerns about weight, resulting in unhealthy weight control practices and eating disorders (Davis & Lambert, 2000; Neumark-Sztainer et al., 1997; Rinderknecht & Smith, 2002; Story et al., 1994). In Canada, First Nations and Métis females living in urban Manitoba prefer thin body sizes and may use dieting to control their weight (Marchessault, 2001). Some First Nations women reportedly feel fat in urban areas dominated by 'white culture', but feel thinner in

their home communities where their Aboriginal culture predominates (Fleming et al., 2006). Some Quebec Cree children with a healthy body weight consider themselves to be too small; whereas other children with excess weight consider their body size to be just right (Willows et al., 2009). Among Quebec Cree extra weight is considered a sign of robustness and strength (Boston et al., 1997) and this belief would therefore potentially create a cultural context where larger body sizes are preferred (Willows et al., 2009). These findings suggest that there is heterogeneity with respect to how First Nations peoples view their bodies, making it important to develop approaches to promote healthy weights that are considerate of the psychosocial constructs of the target group.

d. Conclusions

Beyond limited national survey data and geographically focused initiatives, very little information is known about obesity status in Canada's First Nations population. Existing evidence suggests that childhood obesity is a problem for First Nations children and they have increased susceptibility for risk factors like metabolic syndrome and T2D (Dean, Flett, Wood & Steinman 1998; Dean, 2001; Health Canada 2003b; Katzmarzyk, 2005; Tremblay, Perez, Arden, Bryan, & Katzmarzyk, 2005; Young et al., 2000 Zorzi et al., 2009). For this reason, BMI measurements should be supplemented with measures of waist circumference to assess abdominal obesity. PA data are also limited, but it appears that physical inactivity leads to negative health consequences for this population (Garriguet, 2008). Therefore, to advance the health of First Nations peoples, we need to better document and understand the determinants of obesity

within the First Nations cultural systems of beliefs (Wilson & Rosenberg, 2002; Willows, 2005).

Recent research and commentary suggest that an ecological approach is required to address childhood obesity, given the multidimensional nature of the problem (Pigford & Willows, *In press*; Plotnikoff, Lightfoot, Barrett, Spinola, & Predy, 2008). Interventions with an energy balance focus have had limited impact on the overall problem of childhood obesity (Mayor, 2002) and little attention has been paid to the social and environmental factors that influence obesity (Ebbeling, Pawlak, & Ludwig, 2002). The ecological model suggests that a child's weight status is not only influenced by energy intake and expenditure, but is embedded within the larger ecology of the child's family, community and demographic characteristics (Birch & Ventura, 2009). For this reason, it is important to explore children's perceptions of the lifestyle factors and the environments that can influence body weight and the development of childhood obesity.

2.2 Participatory research

a. Community-based research (CBR)

Community-based research (CBR), which is also referred to as participatory action research, is characterized by interdisciplinary methods, community participation, and an emphasis on building community capacity (Cargo & Mercer, 2008; Wallerstine & Duran, 2003). CBR often uses multiple methods from different disciplines together to develop a research program because communities are influenced by many interconnected socio-cultural

factors (e.g., gender, age, ethnicity, traditions, religions, community or social attitudes, beliefs and values) and require approaches tailored to their specific needs (Adams, 2005; Bisset et al., 2004; O'Neill & Stirling, 2007; Paradis et al., 2005; Swinburn, Egger, & Raza, 1999). To ensure community needs are met, CBR encourages community members to participate in research processes to help identify problems, develop solutions, and facilitate change; this approach encourages community members to buy into the project and feel ownership over the decision making process (Blackburn, 2000; Hesketh, Waters, Gree, Salmon, & Williams, 2005; Paradis et al., 2005; Ritchie, Parry, Gnich & Platt, 2004). Participation also encourages collaboration within the community, increases community agency and builds community capacity (Ritchie et al., 2004). Capacity building is beneficial because it focuses on creating institutional and political relationships that have a higher likelihood of sustainability (Bond, Glover, Godfre, Butler, & Patton, 2001; Paradis et al., 2005; O'Connor, 1995). Together, the components that characterize CBR make it an appropriate approach for research that seeks to address the needs of a specific community.

CBR has the capacity to balance existing power differentials and to promote social justice (Castleden, Garvin & Huu-ay-aht First Nation, 2008; Reason & Bradbury, 2001). Power differentials are often caused by social inclusion/exclusion, which is often the result of political and economic inequalities (Labonte, 2004; Malone, Yerger, McGruder, & Froelicher, 2006). A key feature of effective CBR is working to include individuals and groups in a system (social, economic or political) that can sometimes exclude them,

addressing issues of social justice (Fals-Borda & Rahman, 1991). In Canada, First Nations populations are a historically marginalized group; therefore the adoption of CBR practices may help to equalize existing power disparities. Presently, CBR has been advocated as an approach to address health issues and research gaps relevant to Canadian First Nations communities (Canadian Institutes of Health Research, 2007; Wilson & Young, 2008).

b. Indigenous approaches: Applying CBR practices

Indigenous research approaches have emerged in response to a long history of research, where academic researchers (often without consent) would enter a First Nations community, study the people who live there and leave (Brant Catellano, 2004; Korsmo & Graham, 2002). Criticisms that First Nations people have been ‘researched to death’ denote that the historic research approach was insufficient and oppressive resulting in the need to develop an alternative research approach (Fletcher, 2003; National Aboriginal Health Organization, 2005; Schnarch, 2004). First Nations communities have advocated for research that is more collaborative and meaningful to their communities (Bennet, 2004; Chino & Debruyn, 2006). The resulting Indigenous approaches, which is simply CBR in an indigenous context are much more participatory and illustrate how research can be conducted in a responsive manner that reflects the cultural context.

Indigenous approaches improve access to First Nations knowledge because people are more willing to share information when the research is socially and culturally appropriate (Schnarch, 2004). For example, Castelden et al., (2008) reported that making research tools (e.g., Photovoice) culturally

appropriate proved to be an effective way to engage First Nations peoples and access important information. Improved access to culturally sensitive information enables decisions regarding culturally appropriate methods and interventions to be made more readily (Wallerstein & Duran, 2006). Development of indigenous health intervention programs also provides opportunities for First Nations groups to revitalize their culture through traditional practices (Wallerstein & Duran 2006). This is especially important for First Nations populations who had their culture taken from them via residential schools (Rothe et al., 2006) because this research approach offers a means to facilitate cultural reconnection. In summary, the cultural appropriateness of indigenous approaches ensures that the research process is mutually beneficial for both researchers and participants.

Indigenous approaches also encourage and facilitate the establishment of social networks that extend outside of First Nations communities (Bennett, 2004). Collaborative networks are important because First Nations communities often lack the inclination or local expertise to generate a research agenda (Bennett, 2004). Presently, more Canadian First Nations communities are entering into contracts before allowing researchers to enter their communities (Bennett 2004). By entering into equitable partnerships with researchers and academic institutions, communities engage in, contribute to, and ensure that they benefit from the research process (Bennett, 2004; Bluementhal, 2006).

Participatory research with Indigenous peoples has become an important ethical topic. Globally, the World Health Organization has provided a document to guide participatory research with indigenous populations (WHO, 2008). In

Canada, this topic is prominent in ethics literature evidenced by the Canadian Institutes of Health Research (CIHR) Guidelines for Health Research Involving Aboriginal People (Canadian Institutes of Health Research, 2007) and the new Tri-Council Policy Statement Draft 2nd Edition (Tri-Council Policy Statement, 2008), which includes of an entire chapter on recommendations for conducting research with Aboriginal populations. Considerable work also has been done by Aboriginal groups themselves regarding ethical issues from a cultural perspective (Glass & Kaufert, 2007). The elevation of indigenous voices in ethics policies and methods literature highlights the need to engage in CBR approaches that are tailored to First Nations communities (Castleden et al., 2008).

c. Applying mixed methods research

A mixed methods research approach lends itself well to CBR because it allows for flexibility when designing a study, allowing research to be responsive to the needs of the community (Mertens, 2007). A mixed methods approach is a research approach that combines or associates both qualitative and quantitative research forms (Connelly, 2009; Creswell, 2009). Researchers can utilize quantitative data in combination with qualitative data to come to understand community members' realities (Mertens, 2007). For example, Chilisa (2005) used demographic and epidemiological data (quantitative data) in conjunction with focus groups (qualitative data) to describe the realities of HIV/AIDS for people living in Botswana. Additionally, because mixed methods research is not restricted by predetermined methodologies, mixed methods provide an avenue to enhance the trust between researchers and community members.

Mixed methods also support an ‘advocacy and participatory worldview’ that aligns with Indigenous research methodology (Creswell & Plano Clark, 2007). This world view is influenced by political concerns and focuses on the need to improve society by addressing issues (e.g., empowerment, hegemony, patriarchy) that affect marginalized groups such as Canadian First Nations (Creswell & Plano Clark, 2007). It has been argued that mixed methods research can provide opportunities to convey the experiences of disadvantaged people and people from culturally complex populations (Mertens, 2007). Moreover; mixed methods have been successfully applied to address socially and culturally complex research questions, while employing participatory approaches.

d. Conclusions

Participatory research embodied by Indigenous CBR approaches can be used to address modern health issues in a way that respects the historical, social and cultural contexts of individual First Nations communities (Rothe et al., 2006; Wilson & Young, 2008). The emergence and support of Indigenous CBR approaches with First Nations peoples has resulted in new ways of doing research. It has been suggested that mixed methods research in this context can encourage community participation, involvement and act as a vehicle for social change (Mertens, 2007). In Canada, CBR approaches that emphasize partnerships, capacity-building and incorporate First Nations knowledge are required to address the multi-factorial nature of obesity in First Nations children (Adams, 2005; Bisset et al., 2004; Paradis et al., 2005; Seto, 2006; Willows, 2005; Wilson & Young, 2008).

2.3 Research with children

a. Children's changing role in research

Research rarely considers the views of participants, especially children, which highlight issues of power, representation and agency (M. Hill, 2006; Hesketh et al., 2005; Christensen, 2004). Available knowledge about children's health needs and experiences currently comes from adults, either parents or pediatric health care professionals (Hesketh et al., 2005; Irwin & Johnson 2005; O'Connor, 1995). Traditionally, children were not perceived to have the ability to retrieve information and understand complex questions or concepts, and as a result, children have been treated differently than adults (M. Hill, 2006). This disparity is evident in research settings where children's voices are underrepresented (Horstman, Aldiss, Richardson & Gibson, 2008). Children lack agency to express themselves because they have little control over the opportunities they are given to share their views with adults (M. Hill, 2006). Researchers have a responsibility to find a power balance to ensure that research participants (children) are heard, respected, and valued (Horstman et al., 2008).

Children are in a special position to provide new insights into the health issues that affect them because, like adults, their perceptions are impacted by their social position and unique worldviews (Swinburn et al., 1999; M. Hill, 2006). The opinions and perceptions of children have recently been used to inform childhood obesity interventions (Hesketh et al., 2005; Holt et al., 2008). Children can identify research questions, commission and plan methods, collect data, draw up recommendations and present and disseminate findings (Coad, 2008; M. Hill,

2006; Holt et al., 2008; Irwin & Johnson, 2005). Currently, there is an absence of published research examining the views of school-aged children on developing sustainable obesity prevention programs (Hesketh et al., 2005; O'Connor, 1995).

Over the last two decades, there has been a movement that advocates for the participation of children and youth in health research (Coad, 2008; M. Hill, 2006). This movement may partially be attributed to the United Nations' convention on the Rights of the Child (Article 12), which affirmed a child's entitlement to express their views on matters that affect them (M. Hill, 2006). Because children are 'active agents' who experience and shape their own lives, it is important that they have a voice in research (M. Hill, 2006). Children can also act to make permanent sustainable change; therefore, their involvement in research is critical (Mahr, Wuestefeld, Hall & Krawinkel, 2005). In conclusion, researchers have both ethical and practical responsibilities to include children's marginalized perspective throughout all stages of research projects (Coad, 2008).

b. Research approaches with children

A growth of interdisciplinary techniques to seek child and youth perceptions of health has resulted from the movement to include children in research (Coad, 2008; M. Hill, 2006). These tools offer insights into children's daily lives and health experiences giving professionals, policy makers, and researcher's insight into children's experiences (Coad, 2008; Irwin & Johnson 2005). Participatory methods have become a popular way to engage children in research and to access their unique outlooks on health (Hennessy & Heary, 2005; Horstman et al., 2008). Some of the research techniques that have been used to

access opinions and perceptions include story games, drawing, scrapbooks, maps, photos and videos (Horstman et al., 2008). These new methods are less paternalistic and more collaborative than historical research because the researcher and the participant work together to create an end result with children playing an active role (M. Hill, 2006).

In Canada, research with and about First Nations children is lacking (Young, 2003). Little is known about how First Nations children describe and consider health, obesity and chronic disease. Few studies to date have addressed obesity-related health concerns from a First Nations adolescent perspective and there is no evidence that children under the age of 12 years have been consulted (Isaak, 2008; Joe, 1993; Marchessault, 1998). One on-reserve Canadian study in Manitoba assessed perspectives of health in First Nations youth aged 12-21 years (Isaak, 2008). The author concluded that youth conceptualized health holistically and suggested that the development of culturally appropriate approaches could influence community members to adopt healthy lifestyle practices. This study highlights the dynamic information that can be attained when First Nations children and youth are involved in the research process.

c. Conclusions

The inclusion of children in research offers a unique perspective from an atypical, understudied group. Children have the potential to influence research on multiple levels. In particular, children can contribute to knowledge about the factors that influence childhood obesity, which is important when designing effective intervention strategies. Both Hesketh et al., (2005) and Holt et al.,

(2008) have illustrated how qualitative research that elicits children's perspectives is valuable in creating and planning obesity intervention strategies. This research field is very new and there is no evidence that research on obesity prevention has consulted First Nations children. Therefore, future directives should consider the voices of children when developing strategies to prevent obesity among First Nations children.

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3. Manuscript 1: Exploring associations between obesity, abdominal adiposity and physical activity in First Nations children in Alberta

3.1 Introduction

In Canada, adult Aboriginal peoples (First Nations, Inuit, and Métis) have an increased burden of chronic diseases including obesity, the metabolic syndrome (MetS), and type 2 diabetes mellitus (T2D) (Katzmarzyk & Herman, 2007; Liu et al., 2006; McShane, Smylie & Adomako, 2009; Shields, 2006; Zorzi, Wabi, Macnab & Panagiotopoulos, 2009). Data collected as part of a national survey indicated that the prevalence of obesity among off-reserve Aboriginal children, most of whom were First Nations, was 2.5 times greater than that of non-Aboriginal children (Shields, 2006). National (First Nations Information Governance Committee, 2007) and regional studies (Downs, Marshall, Ng & Willows, 2008; Hanley et al., 2000; Katzmarzyk & Malina, 1998; Ng et al., 2006) of on-reserve populations indicate that pediatric obesity is a health concern, but methodological issues (e.g., self-reported data, lack of lifestyle behaviour information, choice of growth reference) limit our collective understanding of the problem. Additionally, from an Alberta standpoint, there are few data on childhood obesity (Kaler et al., 2006) and no physical activity information for First Nations children living on-reserve.

Waist circumference is a measure of abdominal obesity that is linked to a number of risk factors (e.g., high blood pressure, insulin resistance, dyslipidemia) that comprise the MetS, which often leads to T2D (Janssen, Katzmarzyk & Ross,

2002; Wang & Hoy 2004). Evidence indicates that waist circumference rather than body mass index (BMI) may be more strongly related to obesity-related health risks (Arden, Katzmarzyk, Janssen & Ross, 2003; Janssen, Katzmarzyk & Ross, 2004). For this reason, it is important to include a measure of abdominal obesity in research related to weight status, especially in Canadian Aboriginal children, who have an increased susceptibility for MetS and T2D (Dean, 2001; Lohman et al., 2000; Young, Dean, Flett & Wood-Steiman, 2000). Additionally, physical activity can facilitate weight management and is important in preventing and treating abdominal obesity and the MetS (Katzmarzyk, 2008; Katzmarzyk & Herman, 2007; Liu et al., 2006; Wang and Hoy, 2004). Given the negative health consequences of physical inactivity in Aboriginal peoples (Garriguet, 2008), it is important to examine the links between physical activity and body fat in children.

The purpose of this study was to document the prevalence of *overweight* and *obesity* and explore relationships between abdominal adiposity, weight status and physical activity in Cree First Nations children living on a reserve in Alberta, Canada.

3.2 Methods

This report presents baseline, cross-sectional anthropometric and physical activity data collected in a rural Alberta Cree First Nations community. The Meyo Pematihwiwin (Healthy Living) Project is an ongoing community-based child health project designed to provide a needs assessment that will inform the development of a T2D prevention strategy for the community. All elementary

students (5-12 years old) who attended the community school were eligible to participate in this research. Parental consent and child assent were received prior to data collection, which occurred between October and December, 2008. The study was approved by the University of Alberta Health Research Ethics Board (Health Panel B) and the local Band Chief and Council. The community steering committee for the project reviewed and approved this manuscript.

Weight, height, and waist circumference were measured. Children wore light clothing without shoes and all measurements were taken in private by researchers trained in standardized measurement techniques. A female researcher measured all females and a male researcher measured all males. A female member from the community was present at the time of measurement to ensure children felt comfortable. Anthropometric inter-measurer reliability was tested using males in grades one and two, and there was no statistical difference in measurements between researchers.

Weight was recorded to the nearest 0.1kg using an electronic platform scale (Health-O-Meter 349KLX, Alsip, IL) and height was measured to the nearest 0.1cm using a portable stadiometer (Seca 214, Hanover, MD). Body mass index (BMI) was calculated and weight status was determined according to *International Obesity Task Force (IOTF)* age and sex specific BMI criteria (*normal weight, overweight and obese*) (Cole, Bellizzi, Flegal, & Dietz, 2000). Waist circumference was measured to the nearest 0.1cm with a non-stretch measuring tape at the top of the iliac crest (National Health and Nutrition Examination Survey, 2004) and abdominal obesity status was classified at a waist

circumference >85th percentile of sex-and-age matched children from the NHANES III cohort (McDowell et al., 2009). Abdominal obesity data were examined in relation to sex-specific BMI and step counts in addition to weight categories and physical activity status.

Physical activity was assessed using pedometers (Yamax Digiwalker SW-200, Tokyo, Japan). All pedometers were pre-tested for accuracy on adults using a 50 step walk test and were only used if within 5% error (Tudor-Locke et al., 2006). The pedometer protocol for children was adapted from Ng et al., (2006) for Cree children in Quebec. Each day at the same time, a researcher instructed students to attach the pedometer to their waistband or belt, at a position in line with the patella. Students were provided with pedometer information sheets to take home and were asked to demonstrate how to remove and re-attach their pedometers each day. Students took a 20-step walk test to verify accuracy and appropriate pedometer position. After verification, pedometers were sealed with cable ties to reduce accidental resetting and to discourage behaviour modification due to knowledge of the pedometer's step count. Researchers returned the following day at the same time to record the number of steps taken for the previous 24-hour period. Students were asked to verbally verify that they had worn the pedometer except while sleeping and bathing and were also asked what activities they did the previous day. To encourage pedometer return, a small prize (e.g., pencil, eraser, stickers) was provided each day that the student returned the pedometer.

Physical activity measurements were taken in the fall and weather conditions did not prevent children from participating in outdoor activities. Mean step counts were calculated for an average number of steps/day for a period of three days; two days of pedometer data are sufficient to calculate mean steps/day (Tudor-Locke et al., 2009; Craig, Tudor-Locke, Cragg & Cameron 2010). Children were categorized as *physically active* or *physically inactive* according to whether or not they met sex-specific recommendations for children 6-12 years old (females 12,000 steps/day; males 15,000 steps/day) (Tudor-Locke et al., 2008; Tudor-Locke et al., 2004). Additional analyses classified children into schematic activity zones also for children 6-12 years old: *platinum* (females $\geq 14,500$ steps/day; males $\geq 17,500$ steps/day), *gold* (females 12,000-14,499 steps/day; males 15,000-17,499 steps/day), *silver* (females 9,500-11,999 steps/day; males 12,500-14,999 steps/day), *bronze* (females 7,000-9,499 steps/day; males 10,000-12,499 steps/day), and *copper* (females $< 7,000$ steps/day; males $< 10,000$ steps/day) (Tudor-Locke et al., 2008). Due to the small sample size, *gold/platinum* and *bronze/copper* activity zones were grouped for analytical purposes.

Data were analyzed using *SPSS for Windows v. 17.0* (SPSS Inc., Chicago, IL). Independent samples t-tests were used to examine statistical differences in continuous variables and the Chi-square test and Fisher's Exact test were used to determine statistical differences in categorical variables. Statistical significance was set *a priori* at $p < 0.05$.

3.3 Results

Anthropometric data were collected for 105 children from a total population of approximately 155 children (67.7% participation rate) who attended kindergarten to grade 6 (aged 5-12 years) (females, n=61 (79.0% participation); males, n=44 (56.4% participation)). Eighty-six children wore pedometers for three school days. Anthropometric data were available for all participants; three days of pedometer data were not available for 15 males and 4 females.

Table 3-1 presents sex specific anthropometric and physical activity information. Of the participating students approximately half (47.6%, n=50) were *overweight* (27.6%, n=29) or *obese* (20.0%, n=21), while the other half (52.4%, n=55) of students had a *normal* weight status according to the IOTF reference (Cole et al., 2000). Additionally, approximately half (49.5%, n=52) of the students sampled had a waist circumference exceeding the 85th percentile of the CDC reference (e.g., abdominal adiposity). **Table 3-2** indicates associations between abdominal adiposity with select anthropometric and physical activity variables. Of children with abdominal obesity 40.4% (n=21) were *obese* and 44.2% (n=23) were *overweight*. In total, 88% (n=44) of children who were overweight or obese were also abdominally obese. Abdominally obese children had a higher BMI *versus* their non-abdominally obese peers (22.6 ± 0.6 vs. 17.2 ± 0.3 kg/m²; F=34.7; p<0.001).

Only 36.0% (n=31) of students met pedometer step recommendations for a healthy body composition (Tudor-Locke et al., 2004). There were no significant differences in steps/day across the *normal weight*, *overweight* and *obese*

categories. In total, 71.8% (n=28) of abdominally obese children were classified as inactive as compared to 57.4% (n=27) of children who did not have abdominal adiposity. Although the findings were not significantly different (p=0.2), when examining activity zone classifications, the most prevalent category for abdominally obese children was the *Bronze/Copper* category (41.0%, n=16); whereas the most prevalent category for not abdominally obese children was the *Gold/Platinum* category (42.5%, n=20). Abdominally obese children tended to take fewer steps/day than their non-abdominally obese peers (11238 ± 3482 vs. 12077 ± 2945 steps/day; F=0.7; p=0.2). While abdominally obese females took fewer steps per day than their non-abdominally obese female peers (10554 ± 2456 vs. 11554 ± 2457 steps/day; F=0.1; p=0.1), this difference was not significant, a finding which is likely due to insufficient statistical power. The same observation of fewer steps/day in abdominally obese peers was observed in males (12604 ± 4774 vs. 13091 ± 3715 steps/day; F=1.4; p=0.8). In general, obese, physically inactive children and those in the lowest activity zone were most likely to be abdominally obese.

3.4 Discussion

In our study, the prevalence of obesity in Cree children was more than double the general pediatric population of Alberta (7.5%) and Canada (8.2%) (Katzmarzyk, 2008; Shields, 2006). High levels of obesity were also similar to American Indian Pima children who have one of the highest rates of T2D in the world (Bennett 1999; Lindsay, Cook, Hanson, Salbe, Tataranni, & Knowler,

2002). We found abdominal obesity in 79.3% of overweight and 100% of obese children, which is consistent with another community-based study of Cree children in the province of Quebec where 35.7% of overweight and 97.4 % of obese children had abdominal adiposity (Downs et al., 2008). Using different criteria Zorzi et al. (2009) reported high levels (36%) of abdominal obesity among Tsimshian Nation youth in British Columbia and Potvin et al. (1999) reported that excess weight was centrally distributed in Mohawk children in Kanawake, Quebec. This consistency across geographically disparate populations indicates that a high BMI in First Nations children is linked with increased upper body adiposity. Since abdominal obesity is a significant predictor of the development of MetS and T2D beyond that explained by obesity alone (Katzmarzyk, 2008; Liu et al., 2006; Shields, 2006; Wang & Hoy, 2004), our results suggest that children living on-reserve in Canada are at increased risk for these obesity-related co-morbidities.

In total, only 36.0% of Cree children met daily step recommendations. In general, males took more steps/day than females; however this can be explained by the fact that females are not anticipated to take as many steps/day as males (Tudor-Locke et al., 2008). When comparing the proportion of males and girls who met daily step recommendations, there was no difference ($p=0.3$). Only a minority of children took enough steps to be in the upper physical activity zone classifications (*gold/platinum*). Together this information indicates the need to increase physical activity in this group of First Nations children.

Physical activity levels in Canada recently received a failing grade by the Active Healthy Kids Canada *Report Card on Physical Activity for Children and Youth* (2010), which was informed by national and provincial pedometer step count data from the *Kids CAN PLAY* study for children 5-19 years old (Canadian Fitness & Lifestyle Research Institute, 2009). In general, our findings (11696 steps/day) were comparable to national (11700 steps/day) and Alberta (11600 steps/day) averages for children in 2009. When examining sex- and age-specific data reported by the Canadian Fitness and Lifestyle Research Institute (2007), Cree children in our study, on average, took fewer steps/day than their peers (Cree females: 11098 steps/day vs. Alberta females: 12357 steps/day; Cree males: 12873 steps/day vs. Alberta males: 13657 steps/day). The relative similarities observed in daily step counts between children in our study and the greater population highlights a disparity between obesity status and physical activity levels between Cree and non-Cree children. The disparity perhaps indicates that factors other than total physical activity (e.g., diet, sleep, parental lifestyle habits, environmental factors) are perhaps more important determinants of obesity among Cree than non-Cree children. This difference may also relate to other aspects of physical activity that are not captured by pedometers (e.g., sedentary activity, intensity of activity).

Low physical activity levels may provide an explanation for the high prevalence of abdominal obesity (Mitre et al., 2009) found in Alberta Cree children in our study. In Cree children living in Quebec, the same observation regarding the relationship between obesity, abdominal adiposity and low physical

activity levels were made (Downs et al., 2008; Ng et al., 2006). In both studies, abdominally obese Cree children tended to take fewer steps/day than their non-abdominally obese peers. This finding suggests that many abdominally obese children are also inactive, which may place them at a high risk for developing the MetS and other chronic diseases.

The study's strength is that we reported weight status and physical activity in an understudied population of children using objective measurements. Our data will help build evidence to inform key community stakeholders and inform future directions in priority setting, program development, and evaluation for First Nations children, both in Alberta and nationally. For example, these data will be used to elicit funding to develop healthy lifestyle programs for children and families. The cross-sectional study design and small sample size limit our ability to make broad conclusions. The fact that our findings are very similar to Cree First Nations children in the Province of Quebec, the only other study to provide data on children's weight status, abdominal adiposity and physical activity levels (Downs et al., 2008; Ng et al., 2006) suggests that data may be representative of Cree elementary aged children across the country, although future research should build on this evidence to ensure that these data are representative of all young First Nations children in this community.

In summary, high levels of obesity and abdominal obesity, combined with physical inactivity suggest that Aboriginal children are at increased risk of developing the MetS and T2D. Given the relationship between abdominal obesity and obesity-related health risk (Janssen, Katzmarzyk & Ross, 2002; Wang & Hoy

2004), and the finding that all obese Alberta Cree children were also abdominally obese, it is important that future studies include waist circumference as a measure of adiposity in Cree children. Designing and implementing lifestyle interventions that increase physical activity and/or reduce sedentary activity may assist with weight management and reduce abdominal obesity in these children.

Nonetheless, it is particularly concerning that Cree children had daily pedometer step counts comparable to their Canadian and Alberta pediatric peers, yet the prevalence of obesity was almost three times greater in the Cree population. It is imperative that future research explore different aspects of physical activity (e.g., sedentary activities, intensity of physical activity) and other factors (e.g., diet, sleep, parental lifestyle habits, and environmental factors) that may contribute to the development of obesity and abdominal obesity in this high risk pediatric population.

Table 3-1. Sample characteristics for male and female Cree children

	Total	Males	Females	P value
Anthropometry Total, n [%]	105 [100]	44 [41.9]	61 [58.7]	
Age (y), mean ± SD	9.0 ± 2.3	8.9 ± 2.4	9.0 ± 2.3	0.7
BMI (kg/m ²), mean ± SD	19.9 ± 4.4	20.3 ± 4.6	19.6 ± 4.2	0.4
Weight Status				0.1
<i>Normal weight</i> , n [%] *	55 [52.4]	20 [45.5]	35 [57.4]	
<i>Overweight</i> , n [%]*	29 [27.6]	11 [25.0]	18 [29.5]	
<i>Obese</i> , n [%]*	21 [20.0]	13 [29.5]	8 [13.1]	
Waist Circumference (cm), mean ± SD	71.1±14.1	71.7±14.7	70.9±14.2	0.7
Abdominal Obesity Status				0.4
<i>Abdominally Obese</i> , n [%]†	52 [49.5]	24 [54.5]	28 [45.9]	
<i>Not Abdominally Obese</i> , n [%]†	53 [50.5]	20 [45.5]	33 [54.1]	
Physical Activity Total, n [%]	86 [100]	29 [33.7]	57 [66.3]	
Steps/day, mean ± SD	11696 ±3223	12873 ±4150	11098 ±2464	0.02
Physical Activity Status				0.3
<i>Active</i> , n [%]‡	31 [36.0]	8 [27.6]	23 [40.4]	
<i>Inactive</i> , n [%]‡	55 [64.0]	21 [72.4]	34 [59.6]	
Physical Activity Zone				0.2
<i>Gold/Platinum</i> , n [%] §	31 [36.0]	8 [27.6]	23 [40.3]	
<i>Silver</i> , n [%] §	27 [31.4]	8 [27.6]	19 [33.3]	
<i>Bronze/Copper</i> , n [%] §	28 [32.6]	13 [44.8]	15 [26.3]	

* International Obesity Task Force definitions (sex and age adjusted definitions based on adult cutoffs for *normal weight* BMI < 25kg/m²; *overweight* 25kg/m² ≤ BMI < 30kg/m²; *obese* BMI ≥ 30 kg/m²) (Cole et al., 2000)

† Centers for Disease Control and Prevention definitions (*abdominal obesity*=waist circumference (WC)> 85th percentile; *not abdominally obese*=WC ≤ 85th percentile) (McDowell et al., 2009)

‡ Physically *active* (females (f) ≥12,000 steps/day (s/d); males (m) ≥15,000 s/d); physically *inactive* (f <12,000 s/d; m <15,000 s/d) (Tudor-Locke et al., 2008)

§ *Copper* (females (f) <7,000 s/d; males (m) <10,000 s/d); *Bronze* (f 7,000-9,499 s/d; m 10,000-12,499 s/d); *Silver* (f 9,500-11,999 s/d; m 12,500-14,999 s/d); *Gold* (f 12,000-14,499 s/d; m 15,000-17,499 s/d); *Platinum* (f ≥14,500; m ≥17,500 s/d) (Tudor-Locke et al., 2008)

Table 3-2. Association of abdominal adiposity with anthropometric and activity variables

Measurements (mean ± SD [n])			
Variable	Not Abdominally Obese†	Abdominally Obese†	P Value
Age (y)	9.0 ± 2.2 [53]	9.0 ± 2.4 [52]	0.9
BMI (kg/m²)			
<i>Males</i>	17.2 ± 0.4 [20]	22.9 ± 1.0 [24]	<0.001 ¥
<i>Females</i>	17.2 ± 0.4 [33]	22.3 ± 0.8 [28]	<0.001 ¥
<i>Total Sample</i>	17.2 ± 0.3 [53]	22.6 ± 0.6 [52]	<0.001 ¥
Average Steps/Day			
<i>Males</i>	13091 ± 3715 [16]	12604 ± 4774 [13]	0.8
<i>Females</i>	11554 ± 2457 [31]	10554 ± 2456 [26]	0.1
<i>Total Sample</i>	12077 ± 2975 [47]	11238 ± 3482 [39]	0.2
Measurements (n [%])			
Weight Categories			<0.001 ¥
Normal*	47 [88.7]	8 [15.4]	
Overweight*	6 [11.3]	23 [44.2]	
Obese*	0 [00.0]	21 [40.4]	
Activity Status			0.2
Active‡	20 [42.6]	11 [28.2]	
Inactive‡	27 [57.4]	28 [71.8]	
Activity Zone			0.2
Gold/Platinum§	20 [42.5]	11 [28.2]	
Silver§	15 [31.9]	12 [30.8]	
Bronze/Copper§	12 [25.5]	16 [41.0]	

¥ Indicates significant difference between abdominally obese and non-abdominally obese categories

* International Obesity Task Force definitions (sex and age adjusted definitions based on adult cutoffs for *normal weight* BMI < 25kg/m²; *overweight* 25kg/m² ≤ BMI < 30kg/m²; *obese* BMI ≥ 30 kg/m²) (Cole et al., 2000)

† Centers for Disease Control and Prevention definitions (*abdominal obesity*=waist circumference (WC)> 85th percentile; *not abdominally obese*=WC ≤ 85th percentile) (McDowell et al., 2009)

‡ Physically *active* (females (f) ≥12,000 steps/day (s/d); males (m) ≥15,000 s/d); physically *inactive* (f <12,000 s/d; m <15,000 s/d) (Tudor-Locke et al., 2008)

§ *Copper* (females (f) <7,000 s/d; males (m) <10,000 s/d); *Bronze* (f 7,000-9,499 s/d; m 10,000-12,499 s/d); *Silver* (f 9,500-11,999 s/d; m 12,500-14,999 s/d); *Gold* (f 12,000-14,499 s/d; m 15,000-17,499 s/d); *Platinum* (f ≥14,500; m ≥17,500 s/d) (Tudor-Locke et al., 2008)

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4. Manuscript 2: Exploring First Nations children's perceptions of healthy foods and activities: A qualitative study to inform culturally relevant obesity prevention strategies

4.1 Introduction

In Canada, the prevalence of obesity in First Nations children is twice as high as the general population (McShane, Smylie & Adomako, 2009; Shields, 2006; Wang & Lobstein, 2006). This situation makes obesity a significant public health concern for this ethnic group since obesity-related chronic diseases such as metabolic syndrome and type 2 diabetes are highly prevalent among First Nations children (Dean, Young, Flett & Wood-Steiman, 1998; Kaler et al., 2006; Young, Reading, Elias & O'Neil, 2000; Zorzi, Wabi, Macnab and Panagiotopoulos, 2009). To effectively promote healthy weights and minimize obesity-related health problems early in life, a comprehensive understanding of the factors that influence childhood obesity is required (Birch & Ventura 2009; Plotnikoff, Lightfoot, Barrett, Spinola & Predy, 2008; Willows 2005a). However, despite the high prevalence of childhood obesity, there is little published research in Canada on First Nations children's perceptions of healthy foods and activities (Isaak, 2008; Pigford & Willows, *In Press*; Willows, Marshall, Raine, & Ridley 2009a). Since the predominant paradigm to understanding children's activities and behaviours has been to consult with parents or other adults, little data are available from children themselves (Irwin & Johnson, 2005; Tudge & Hogan, 2005). Therefore, including First Nations children as key informants about lifestyle practices can

complement epidemiologic data and facilitate the development of childhood obesity prevention strategies that cater to children's preferences and needs.

Obesity prevention efforts that begin in early life have been shown to be more successful than those started later in life (Birch & Ventura, 2009; Shonkoff & Phillips, 2000) making it important to explore children's perceptions to inform strategies that promote healthy lifestyles. Children have the capacity to create permanent, sustainable changes (Mahr, Wuestefled, Hall & Krawinkel, 2005) and are often the target of directives to prevent obesity making their involvement in research critical. To date, there is little evidence that First Nations children (< 12 years old) have been consulted to guide obesity prevention efforts, although some research has queried perceptions of health among First Nations youth (≥ 12 years old) may provide insight. For example, the First Nations Regional Health Survey (RHS) 2002-2003 reported that First Nations youth seek a state of being that balances physical, emotional, mental and spiritual components indicating that they view health more broadly than simply the absence of disease (First Nations Information Governance Committee et al., 2005; Gideon et al., 2008). One of the only published Canadian studies that conducted focus group interviews with First Nations youth about their perceptions of health found that youth incorporated into their discussions of health both traditional lifestyles and values from contemporary society. Youth also employed concepts from the Medicine Wheel (Isaak, 2008), a First Nations construct that depicts health as a balance among physical, spiritual, emotional and mental elements (Royal Commission on Aboriginal Peoples 1996; Warbe, 2005). These two studies highlight the

importance of including First Nations cultural values when developing strategies to promote healthy lifestyles for youth, but a lack of evidence from children represents an important research gap (First Nations Information Governance Committee et al., 2005; Isaak, 2008).

Few studies have examined obesity in on-reserve First Nations children within the context of the determinants of health (Pigford & Willows, *In Press*). Because First Nations cultures have different values, traditions and sometimes different food choices from those of the general Canadian population, First Nations peoples may have unique determinants of health specific to their culture (e.g., cultural practices, beliefs, and values) that may influence their risk for developing obesity (Vallianatos et al., 2008; Willows, 2004; 2005a; Willows, Veugelers, Raine & Kuhle, 2009b). For this reason, it is important to identify cultural determinants of health that may contribute to the development of obesity in First Nations Cree children.

The purpose of this study was to explore children's perceptions of food, activity and health. Using qualitative focus group interviews, this research assessed children's (1) traditional knowledge and the influence of culture in shaping children's views of healthy foods and activities, (2) perceptions of healthy foods and activities, and (3) food and activity preferences. This qualitative information can complement existing quantitative data, employing a mixed methods approach to help the community and school to better understand how to prevent childhood obesity.

4.2 Methods

Participants and Community Demographics

All students attending grades four and five (aged 8-10 years) at the community school were eligible to participate in this study. Prior to the study initiation, informed consent (for parents) and assent (for children) procedures were completed. The study was approved by the University of Alberta Health Research Ethics Board (Health Panel B) and the local Band Chief and Council. A Steering Committee comprised of community members, health workers and researchers reviewed the research protocol to ensure the appropriateness and cultural sensitivity of the research.

This research was conducted in a rural reserve community comprised of Cree First Nations (population ~960), which includes approximately 35 children who were in grades four and five. The reserve is located 21km from a town of 6500 people and 65km from a large metropolitan city with a population exceeding 1 million people. There is one convenience store located on the reserve that has a limited selection of healthy foods according to an unpublished food basket survey conducted by the research team. Family income and educational level attainment were lower than the Alberta provincial average (Statistics Canada, 2010).

Data Collection

Using a qualitative research approach to investigation, we elicited participants underlying perceptions regarding health, food and activity. Focus groups were utilized because they allowed for a culturally relevant storytelling, narrative approach that is valued by First Nations culture (Poff, 2007; Rothe et al.,

2006), are a successful data collection method with children to yield rich contextual data (Hennessy & Heary, 2005; Horstman et al., 2008), and are an expedient mean of data collection (Krueger, 1994; Krueger & Morgan, 2001).

Each focus group included four to six participants, which is within the recommended group size for research with children (Krueger, 1994). Sessions were between 45 and 55 minutes in duration and were held during school hours in the school library to provide for a neutral location that was familiar to all participants (Hennessy & Heary, 2005). Participants and researchers (one primary facilitator and one secondary facilitator) sat in a circle around a table during the interviews in accordance with cultural practice and focus group methodology (Krueger, 1994; Morgan, 2001; Roth et al., 2006).

Focus groups were designed to be exploratory. Using an interview guide (Appendix H), questions progressed from general to specific (a funnel approach) to encourage discussion (Grudens-Schuck et al., 2004; Rothe, 2002). The interview guide was pretested for methodological appropriateness and refined accordingly. To ensure cultural sensitivity, focus group procedures were also discussed with and approved by the project Steering Committee. The guide was not followed verbatim to allow participants the flexibility to discuss what they deemed important. Interview questions were accompanied by drawing and pile sorting activities to elicit discussion among children who tend to be more comfortable conversing with their peers than with adults (Hennessy & Heary, 2005; Hesketh et al., 2005; Horstman et al., 2008; Krueger & Casey, 2000; Mauthner, 1997). Specifically, children created two drawings of foods they liked

to eat and were asked individually to discuss their drawings. As a group, children were then asked to sort the drawings into one of two piles (healthy or unhealthy) and discuss why the drawings were placed in the piles. Identical steps were followed for the activities children liked to do. Throughout the interview and subsequent manuscript the term *activity* is intentionally used rather than *physical activity* because First Nations peoples can have a holistic view of health that includes physical, spiritual, emotional and mental factors (Turton, 1997; Warbe, 2005). The term activity is better able to accommodate the broad nature of health embodied by traditional activities, only some of which might be exercise or sport-related, but are important in determining the wellbeing of First Nations peoples (Adelson, 2000; Isaak, 2008; Wilson & Rosenberg, 2002).

Data Analysis

Focus group sessions were audio recorded (Olympus DS-50, Center Valley, PA) and the secondary facilitator took field notes to aid analysis. The primary facilitator directed the focus groups by asking questions from the interview guide and did not volunteer any personal thoughts. The resultant dialogue was transcribed verbatim into electronic format. To ensure accuracy and completeness, transcripts were checked twice by the primary facilitator against the voice recording and compared with study field notes. Corrections to the transcripts were made when necessary. Data were analyzed using recommendations by Hennessy & Heary (2005). Transcripts were read and preliminary themes were created that emerged across all focus groups. A coding system using color codes (Betrand, Brown & Ward, 1992) was created and line-

by-line analysis was used to categorize data. Data were considered inclusive and categories were added to reflect new information. Categories were compared to the initial themes and themes were re-evaluated.

An ecological model was used to guide our investigation of perceptions of foods, activities and health among First Nations children by examining the relationships between the individual determinants of child health (e.g., biomedical, attitudinal, and behavioral) and the greater contextual environment (e.g., social, organizational, community, public policy, and physical environments) (Plotnikoff, et al., 2008; Swinburn et al., 1999). In an obesity context, an ecological model suggests that a child's weight status is embedded within the larger ecology of the child's family, community and demographic characteristics in addition to being influenced by energy intake and expenditure (Birch & Ventura, 2009). Therefore, we examined children's perceptions about these ecological factors that may influence obesity among First Nations children.

Methodological Rigor

To ensure validity, themes and subthemes were discussed with the project's research team throughout analysis and redefined accordingly. Due to logistical constraints, and to not unduly interrupt children's time in the classroom, member checking with children was not done; however, data were presented to the study's Steering Committee to solicit feedback and validate the themes. The Steering Committee requested the removal of sensitive information and participants quotations referring to spiritual and sacred cultural practices, foods and activities. The omission of this information respected the cultural practice in

this community of only using oral transmission for spiritual and sacred cultural knowledge. Therefore, the names of some cultural and ceremonial events and foods mentioned by children have been excluded from this report.

4.3 Findings

In total, 15 participants (10 girls; 5 boys) took part in one of three focus groups held between June and October, 2009. These results describe the factors that influence First Nations children's perceptions of health, food and activity. Three key themes with related subthemes emerged across interviews. The first theme *Cultural/Traditional Knowledge* represented a general 'umbrella' theme that was woven throughout all discussions and was found within the two other themes (*Importance of Family*; and *Meaning of Health*). Using an ecological framework as an interpretive lens, these themes attempt to capture the larger ecology of children's individual and environmental contexts including culture, family, and understandings of health.

Umbrella Theme: Cultural/Traditional Knowledge

The majority of discussions in all three focus groups revealed an underlying influence of culture. This finding is highlighted by **Table 4-1** and **Table 4-2**, which illustrate children's preference for cultural/traditional foods and activities. The preference for cultural foods and activities is emphasized further by participant discussions, indicating that participants live within an embedded cultural framework.

Throughout discussions, children self identified with their First Nations culture by referring to “*us natives*”, “*we*” and “*our culture*”, which illustrated a shared understanding of what constituted First Nations cultural identity. Self identification often occurred as a result of children clarifying what was included as part of their culture. For example, when asked if they liked traditional foods, one child answered “*I like Chinese food...*” while another child corrected “*No, like our culture.*” It was common for children to suggest that traditional foods were important for self identification, highlighted by the following exchange between two participants:

A: [*Traditional food*]'s gross I don't like it.

B: So you're not Indian? You don't eat good foods?

One participant also explained that the reason children like to powwow dance¹ is simply because “*It's part of our culture.*” Pride and ownership of one's culture were evident across all interviews.

It was difficult to discern between traditional foods and cultural events as they were highly integrated in children's discussions. Traditional foods can be eaten in daily life as well as at cultural events, such as culture camps², powwows³, and ceremonial events. Children detailed this point through comments such as, “*Yesterday I helped my mom make bannock⁴*”, and “*When my kokum⁵ made*

¹ A cultural dance performed at a gathering.

² A gathering of old and young people to exchange and share cultural knowledge.

³ A social gathering or fair that usually includes competitive dancing.

⁴ Baking powder bread that can be fried, baked or cooked over a fire, sometimes with dough wrapped around a stick over an open flame.

⁵ The Plains Cree word for grandmother.

bannock and when I go to my kokum she makes the best stew when we have our [cultural events]” and another participant explained that “...my friend, my friend she went to a [ceremonial event] and after that they ate [cultural foods].”

Hunting provided the traditional foods that were eaten at cultural events and in daily life. Thus, an activity (e.g., hunting) is intertwined with traditional food procurement. One participant noted, “*Um, a month ago, my dad and uncle were driving to a baseball game and then on the way back they saw two mooses. And then um my dad called these other people and then they got down and got those mooses. And then we...me and my dad and the whole family still has um moose um meat at home.*” Another participant noted that “*... um my friend and his big brother, and his father had to go shoot um had to go shoot animals for the [culture] camp.*”

It was also difficult to distinguish among different cultural activities. Many activities formed a single event (e.g., cultural dances and powwows) that occurred at the same time. For example, one participant said that, “*When something happens good then we celebrate then, then they tell everyone that they're having a Powwow then they get their children ready to dance.*”

Children spoke about cultural practices, many of which were associated with food. A skill shared by a number of participants is that they, “*...know how to make bannock,*” which is also highlighted by the following exchange:

A: I know how to make Bannock on a stick.

QUESTION: *Bannock on a stick?*

B: Yeah, that's easy just cook it over a fire.

The handling and acquisition of sacred and ceremonial cultural foods were discussed. Children also described sacred cultural practices associated with cultural events, activities and ceremonies, but have been omitted based on recommendations of the study Steering Committee.

Theme: The Importance of Family

Children indicated that they spent a lot of time with family members particularly in reference to cultural activities. For example, one child reported having participated in cultural dances with “*my brothers and my cousin and my other cousin and my friend,*” while another child stated they danced with “*My cousins,*” and another participant with their “*sister.*” The statement “*my kokum and my dad and mostly everybody wants me to dance and I have sports over the summer so and I help out my dad at my mushum’s⁶ culture camp*” suggests that parents and extended family support children’s participation in cultural activities. Traditional foods were consumed with family members, such as “*My Kokum,*” “*I eat, I eat traditional food with my mom...*” and “*My uh, my Uncle and my Uncle.*”

In general, children reported that they did non-cultural group activities such as soccer and fastball with friends and other non-relatives. Nonetheless, children still reported some family member participation in non-cultural activities. Both cultural and non-cultural events took place outside of the community; however, cultural events outside of the community were more likely to involve

⁶The Plains Cree word for grandfather.

family members than non-cultural activities taking place outside of the community.

In reference to traditional foods and cultural events, parents, grandparents, and elders were the source of health information. When asked who taught about their sources of health information, children identified family members. Most frequently “mom” or “kokum” or both were identified as primary sources of information about healthy foods and activities. For non-traditional foods, family members were recognized first followed by other sources (e.g., “school,” “commercials,” “TV,” “friends from sports teams,” “the government”).

Knowledge gained from older relatives informed children’s health beliefs. Children often referenced family members’ behaviors and health histories to reinforce their health beliefs. For example, when discussing Indian popcorn⁷, one child stated, “*It’s healthy, man. My Uncle makes it all the time, he doesn’t get diabetes.*” Another child emphasized this point by stating that junk food was unhealthy, “*‘Cause my dad had a heart attack from eating too much unhealthy foods.*” Beliefs about fast food were also justified in this manner. One participant said that “*My auntie eats whatever, My auntie eats fast food,*” while another child stated “*...my mom told me to not eat anywhere because this one person ate too much McDonald's every day, every week, and then he wouldn't stop going to McDonald's and he died and he got cancer*” and another respondent stated that “*... my brother said actually A&W is probably the healthiest place you*

⁷ A snack of fried pork rinds and lard.

could go.”

Theme: The Meaning of Health

Children were generally well informed about the value of healthy foods. Healthy foods were seen as foods that contained important nutrients like “*Vitamin A and Vitamin B and Vitamin C*” and foods that “*gives you iron.*” These characteristics of food were important “*‘Cause you’re growing*” and “*Because you want to be strong.*” Children also emphasized liking the “good” taste of healthy foods “*‘cause they’re delicious and they’re healthy*” “*And they’re fruitable. I like them ‘cause they’re tasty I guess.*”

Healthy activities were associated with a number of different attributes (e.g., movement, exercise, learning, strength, and body size). Children related the amount of movement and exercise involved in an activity to the health benefit it provided. Video games associated with movement such as Nintendo Wii™ were considered healthy; however, sedentary video games were not deemed healthy. Additionally, cards and listening to music were considered unhealthy by some participants as these activities require little movement “*‘Cause you’re just sitting there.*” However, activities such as reading and homework were identified as healthy because they involve learning, which “*helps your brain.*” Strength was also an important factor in determining whether or not an activity was healthy. Running was seen as beneficial because it “*gets your legs stronger so you could run longer*” and fort building was healthy because it,

A: *...gets you all strong*

B: *Then you’ll be able to do more stuff if you’re stronger.*

Activities that “*make you thinner*” and make “*you lose weight*” were also considered to be healthy.

When children were asked to describe an unhealthy person, references were made to a variety of chronic conditions including obesity, heart attacks, diabetes, and dental caries. Children considered obesity to be an undesirable trait and described an unhealthy person as “*chubby*” and “*sloppy*.” Children praised exercise because “*You get thinner*” and “*You get no more cramps and you lose weight*.” Heart health was addressed by the comments, “*if you eat junk food you get a damaged heart. If you eat vegetables you won't even get a damaged heart*.” Participants discussed diabetes as an undesirable disease that developed as a result of eating unhealthy foods. When asked about diabetes and health participants stated,

A: Because you'll die, you'll get cancer

B: No, uh, that is, is, isn't diabetes when your blood sugar, like you can't have any more sweet stuff?

C: I, I uh, no, no, you're saying

A: No you're, it'll look, it's like you have to have some sweet stuff and then some solid stuff.

While responses were variable, children agreed that diabetes was unhealthy. Additionally, some children considered poor dental health to be an indicator of an unhealthy person.

Children recognized nature and the earth as important when assigning the labels “*healthy*” or “*unhealthy*” to a food or activity. When asked to describe

healthy foods, children replied that food is healthy because of “*the seeds*” or if “*They’re from the ground,*” or if it “*grows on a plant*” or simply “*’Cause it’s from nature.*” Cultural dishes and animals were also seen as healthy “*’Cause [cultural dish] is from nature*” and “*Because it’s animal it’s part of nature.*” As the following exchange demonstrated, shrimp were considered healthy,

QUESTION: *Why is shrimp healthy?*

A: *Because it's fish*

B: *It's an animal. It's a fish.*

QUESTION: *So why is fish healthy?*

C: *Um 'cause it comes from the water.*

B: *Because it never eats anything wrong or nothing or never ate anything unhealthy in its time.*

Children reported activities such as littering as unhealthy “*’Cause it wrecks the earth and it makes Mother Earth angry*’ and recycling as healthy. The health of the planet is important to these children, as illustrated by the following exchange,

A: *Oh, this is unhealthy*

B: *The paper’s unhealthy?*

A: *Yah, ‘cause it kills trees.*

Because environment and nature were valued by participants, many of the sacred ceremonial practices associated with nature were considered to be healthy.

Children discussed the ceremonial practices linked to nature, health and hunting; however, quotations associated with this content were removed to respect the Steering Committee’s requests.

In general, children liked foods and activities that they considered to be healthy. **Table 4-1** and **Table 4-2** represent the preferred foods and activities children discussed in the interviews. The tables are sorted according to how children classified the food or activity (healthy or unhealthy). The Unclassified category indicates that children did not explicitly state if the activity was healthy or unhealthy.

4.4 Discussion

In this study, we explored First Nations children's perceptions of health, foods and activities by identifying the influence of culture on children's beliefs, as well as children's perceptions and preferences for foods and activity. The results showed that overall children's perceptions are shaped by a number of contexts (e.g., cultural/traditional knowledge, the importance of family, factors that determine the meaning of healthy). These findings are important since they highlight the need for culturally relevant strategies that include family members and consider children's health understandings to promote healthy lifestyles. Applying an ecological framework to interpret these findings revealed that children's perceptions and preferences were affected by and affected multiple levels of influence (Cook, 2005; McLeroy, Bibeau, Steckler & Glanz, 1988; Story et al., 2002), an observation that reinforces the importance of considering several different contexts when promoting healthy weights in First Nations children.

Culture is broadly defined as the system of shared ideas, concepts, rules and meanings that underlies the way that human beings live (Keesing & Strathern,

1997). Children's perceptions of healthy foods and activities were influenced by their cultural context. This finding suggests that the transmission of cultural knowledge to children may be valued in this specific community. The notion of intergenerational knowledge transmission is supported by data from the RHS 2002-2003, which showed that 83% of First Nations children placed importance on traditional culture (First Nations Information Governance Committee et al., 2005). This is important because cultural beliefs may make an important contribution to both the health and weight status of First Nations children (Wang & Tussing, 2004; Willows, 2004, 2005a; Willows et al., 2009b). In general, culture influences eating behaviors and food procurement practices by defining which foods are acceptable and preferable, when and how to eat, and how to properly acquire these foods in an acceptable manner (Kittler & Sucher, 2004). For example, children in our study indicated that traditional foods and activities (e.g., hunting) associated with nature are inherently healthy. Among Cree in northern Quebec, there are similar cultural beliefs to suggest that healthy living is tied to the natural world, life in the bush, traditional foods and food procurement activities (Adelson, 2000; Vallianatos et al., 2008). Children are not simply passive recipients of their culture; rather, children learn about their culture by actively participating in practices. The concepts, skills, and knowledge learned from cultural activities are then interpreted and transformed on the basis of children's own characteristics, experiences, skills and knowledge (Tudge & Hogan, 2005). Thus, the perceptions of First Nations children in the current study

were developed as an intersection of traditional Cree values and the values of the larger society beyond the community to which children were exposed.

Even though First Nations peoples have reduced their consumption of traditional foods and the frequency of hunting, fishing and food gathering activities over recent decades (Gracey & King, 2009; King, Smith & Gracey, 2009; Seto, 2006) children in our study consumed traditional foods and were aware of the associated procurement activities. While this finding is valuable, it is important to recognize that just because children prefer and are aware of traditional foods, preferences and awareness may not influence in the actual intake of these foods. Studies of other First Nations show that while children may prefer certain traditional foods, they seldom eat them due to lack of availability (Bernard et al., 1995; Gee, Hawrysh & Wein, 1993; Trifonopoulos, 1995). Although many Aboriginal children's diets include only a small amount of traditional foods, these foods are generally healthy, they tend to be lower in fat than store bought foods, and can contribute substantially to children's intake of micronutrients (Downs et al., 2009; Kuhnlein & Receveur, 2007). Therefore, not only are traditional foods preferred by children, and ensure cultural continuity, they may contribute to a healthy diet. The "Eating Well with Canada's Food Guide - First Nations, Inuit and Métis" version reflects the importance of both traditional (e.g., hunted and gathered) and store-bought foods for First Nations people living in Canada and includes readily available traditional foods in addition to market foods (Health Canada, 2007a). It is important to encourage First Nations children to eat traditional foods and to participate in cultural

activities as an obesity prevention strategy that utilizes a cultural lens and incorporates traditional knowledge and practices.

Family and community are more highly valued and emphasized by First Nations peoples than the notion of the individual (Health Canada, 2009). The importance of family/community informed the recommendations for the prevention of T2D in children to emphasize the importance of family/community, which suggests that group activities include elders and that community members be encouraged to be active role models for children (First Nations and Inuit Health Committee of The Canadian Paediatric Society, 2005). Families play an important role in the formation of children's dietary and activity-related behaviours (Birch & Fisher, 1998), which explains why obesity prevention strategies that have engaged parents, families and communities have been more successful than those that target children exclusively (Economos et al., 2007; Hesketh et al., 2005; Shepard et al., 2002; Summerbell et al., 2003). Our results indicate that family members are the main source of health information and emphasize the need for adult community members (e.g., parents, grandparents and extended family members) to be active role models. Parent and adult behaviours influence what children learn and expect from themselves with respect to lifestyle practices (Shonkoff & Phillips, 2000). The fact that children in this study discussed poor health choices made by adult family members suggests that it is important to address adult lifestyle behaviors to effectively promote healthy lifestyles for children.

Allowing children to describe the meaning of health in terms of foods and activities revealed sources of knowledge as well as misinformation. Teachers and the school administrators were not mentioned by children as sources of health information suggesting that children rely heavily on family members and experiential learning to provide them with health information. This finding also indicates that obesity prevention programs for elementary aged children should include a strong focus on family member engagement. It is noteworthy that the chronic diseases mentioned by children were those that disproportionately affect the First Nations population (e.g., obesity, heart disease, diabetes and dental caries) (Heart and Stroke Foundation of Canada, 2010; McShane et al., 2009; Young et al., 2000; Young, 2003). However, children's understanding of these chronic conditions appears limited. While children expressed knowledge of diabetes as unhealthy, they were not able to explain diabetes in detail. A DVD for children aged 8-12, produced by the Alberta Native Friendships Centres called "Sacred Circle: Type 2 Diabetes Prevention for Aboriginal Children" is an educational resource that encourages holistic wellness and could provide children with age appropriate information about chronic disease to enhance knowledge. In addition, children did not refer specifically to the medicine wheel, a tool that is often useful in explaining First Nations understandings of health (Isaak, 2008). Future health initiatives in the school and community may seek to teach children about holistic health concepts associated with the medicine wheel or sacred circle (Turton, 1997; Warbe, 2005) to address the areas where these children lack knowledge.

Participants identified individual food and activity preferences that can inform obesity prevention strategies. However, the healthy foods that children preferred may not be accessible or available to them since food insecurity is common among Canadian Aboriginal peoples (Chan et al., 2006; Egeland, Pacey, Cao & Sobol, 2010; Health Canada, 2007b; Power, 2008; Willows 2005b; Willows et al., 2009b). Additionally, the market foods available on Canadian reserves and American reservations are usually expensive and there is inadequate availability of healthy foods, which can result in poor diets (Curran et al., 2005), which is true for this small community as it has just one local convenience store with limited healthy food options. Issues with availability and accessibility speak to social and physical barriers within the environment that limit healthy lifestyle choices. Children also indicated a preference for cultural activities and sports involving exercise and movement; however, most children in this community are not reaching daily physical activity recommendations (Pigford et al., *unsubmitted manuscript*). A number of barriers may prevent children from participating in preferred activities. It is possible that children may not have access to safe environments and facilities to do the activities they enjoy, or that families' economic constraints may prevent children from participating in activities which require money (Cloutier et al., 2008). Regardless, little is known about the factors that influence First Nations children's activity patterns, therefore future research is needed to further examine why children are not meeting these recommendations. The next step is for researchers to work collaboratively with the study community to prioritize and create an action plan to enable children

access to children's prioritized preferred foods and activities listed in **Tables 4-1** and **4-2**.

Finally, children's discussions directly support an ecological approach to healthy weight promotion by suggesting that it may be difficult to apply an energy balance approach that focuses on traditional food (energy input) and activity (energy expenditure) as separate entities to promote healthy weights (Bell et al., 2008). First Nations peoples have a holistic, cyclical world view (Adelson, 2000) and findings from this study suggest that First Nations children do not distinguish between traditional foods, cultural events, ceremonies and traditional activities. Therefore, it would be difficult to create a strategy that focuses on energy intake as distinct from expenditure within a worldview that does not differentiate between foods and activities. Ecological approaches to obesity prevention suggest that children's weight status is embedded within a larger ecology that consists of culture, family, community and other contextual factors (Birch & Ventura 2009; Plotnikoff et al., 2008). For example, the Kahnawake Schools Diabetes Prevention Project in a Mohawk First Nations community in Quebec (Adams 2005; Bisset, Cargo, Dleormier, Maculay and Potvin 2004; Paradis et al. 2005) and the Sandy Lake Health and Diabetes Project in an Ojibway-Cree community in Ontario (Hanley et al., 2000; Saksvig et al., 2005) both developed culturally-relevant health education curriculums for children that focused on knowledge and skills development related to healthy eating, physical activity, and diabetes education; however these attempts were supported by a family component and greater community components (e.g., radio shows, community

gardens). Thus, ecological strategies have the capacity to be used to develop culturally-relevant programs to promote healthy weights and lifestyles for First Nations children.

There are a number of strengths and a few limitations associated with this study. The importance of including children's perceptions and preferences in research is still fairly novel. The individual community focus is positive because it facilitates the generation of community-specific knowledge necessary to design programs to encourage healthy lifestyles among the children. However, as an individual study, the nature of qualitative research combined with a focus on an individual community limits the generalizability of these findings to other settings without other complementary research (Horsburg, 2003). Considering the heterogeneity of First Nations cultures, it is important to recognize that children's perceptions of health will vary among First Nations groups, in part because understandings are dependent on cultural values as well as exposure to other socializing factors (e.g., television). This study may be limited since children have not completed their cognitive and emotional development and, therefore, may lack the communication skills to express themselves to the same degree as adults (Hill, 2006). To mitigate this issue, techniques such as drawing and pile sorting were used to help children express themselves (Horstman et al., 2008). Finally, the omission of supporting quotations related to sacred cultural and ceremonial practices limited our discussion. However, it was necessary to respect the values of all parties involved in this research, especially the Wisdom Committee that informed several aspects of this research. In general, community

based research and the inclusion of children as informants provides the opportunity to challenge orthodox notions of what research has been and can be in the future.

4.5 Conclusions

First Nations children's perceptions are shaped in response to the many contexts in which they live; therefore, it is necessary to employ a multilevel, ecological approach to promote healthy weights. These findings have important implications for policymakers, health and educational professionals, and researchers because they emphasize the need to consider socio-cultural factors, as well as children's perceptions and preferences when designing culturally-relevant strategies to promote healthy lifestyles that effectively address community specific requirements. This research also emphasizes the importance of consulting children to help inform the directions of future health promoting strategies that affect them. Children were able to offer knowledge that was relevant to their world. Insights gained from children's descriptions of healthy eating and activities highlight the need to integrate First Nations cultural practices into community programs and the school curriculum, as well as to ensure that parents, extended family members, and elders play prominent roles in future initiatives to prevent childhood obesity and promote healthy lifestyles among First Nations children in this community.

Table 4-1. First Nations children’s preferred foods according to whether children considered the activities to be healthy, unhealthy, both or if they remained unclassified

Healthy	Unhealthy	Both*	Unclassified†
Baked bannock‡§	Candy	Ice cream	Perogi‡§
Dried meat‡	Chips	Indian popcorn‡§	Raw fish
Fruit (banana, cherry, apple, grapes, peaches, watermelon, kiwi, pear, cantaloupe, strawberries, pineapple, fruit salad)	Chocolate bars	Pizza	
Greek salad	Fried bannock‡§		
Lasagna	Junk food		
Meatballs	Pop		
Milk	Popcorn		
Moose meat‡			
Moose meat soup and stew‡			
Noodles			
Rabbit soup‡			
Ravioli			
Salad			
Shrimp			
Soup			
Spaghetti			
Spinach pizza			
Steak			
Ceremonial Foods‡			
Vegetables (celery, beans, carrots, potatoes, broccoli, tomatoes)			

Children listed and then sorted the foods that they prefer/like to eat.

* Both signifies that children discussed the food as healthy and unhealthy; a consensus was not reached

† Children did not explicitly state if the food was healthy or unhealthy

‡ Traditional Food

§ Definitions:

Baked Bannock- Baking powder bread baked in an oven.

Fried Bannock- Baking powder bread typically fried in lard.

Indian Popcorn- A snack of fried pork rinds and lard.

Pierogi- Boiled or baked dumplings stuffed with varying ingredients.

Table 4-2. First Nations children’s preferred activities according to whether children considered the activities to be healthy, unhealthy, both or if they remained unclassified

Healthy	Unhealthy	Both*	Unclassified†
Chinese baseball	Listening to music	Playing cards	Culture camp
Cleaning	Littering	Video games	Kayaking
Eating			Making key chains, dream catchers, moccasins‡§
Fastball/ baseball			Making teepees‡§
Fort building			Martial arts
Hockey			Swimming
Homework			Television/Movies
Hunting‡			
Playing on treaty day‡§			
Playing at powwow grounds			
Powwows‡§			
Racing/running			
Reading			
Recycling			
Riding bikes			
Shooting/war games			
Soccer			
Tag			
Traditional practices‡§			
Volleyball			

Children listed and then sorted the activities that they prefer/like to do.

* *Both* signifies that children discussed the activity as healthy and unhealthy; a consensus was not reached

† Children did not explicitly state if the activity was healthy or unhealthy

‡ Traditional Activity

§ Definitions:

Dream catchers- A handmade object consisting of a web woven on a willow hoop that is decorated with personal and sacred items.

Moccasins- A shoe made of soft leather.

Teepees- A conical tent made of animal skins or birch bark.

Treaty day- The anniversary of the signing of a Treaty.

Powwows- A social gathering that includes competitive dancing.

Traditional practices- A generic term to describe sacred and ceremonial practices.

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5. Conclusions and Future Directions

5.1 Summary of findings

Little is known about the prevalence of obesity among First Nations children living in western Canada, and even less is known about abdominal obesity and the lifestyle determinants that influence the development of childhood obesity (Belanger-Ducharme & Tremblay, 2005; Kaler et al., 2008; Willows, 2005). This research was responsive to community concerns about childhood obesity and the development of T2D among Cree First Nations children living on a reserve in Alberta. This thesis includes two studies that were conducted using an explanatory sequential mixed methods approach (e.g., a quantitative study followed by a qualitative study) (Creswell & Plano Clark, 2007) to create a descriptive profile of Cree First Nations children living in one Alberta community. Combining quantitative and qualitative research methods in this order provided the opportunity to use the qualitative data to help explain the quantitative findings (Creswell & Plano Clark, 2007).

Study One (quantitative) of this thesis was undertaken to assess the prevalence of overweight and obesity, abdominal obesity, and physical activity among First Nations children. A school-based assessment of 105 children found that almost half of children were overweight or obese, and almost all of the participants who were overweight or obese were also abdominally obese. In total, few students met the recommended daily number of steps. Abdominally obese children tended to take fewer steps/day than their non-abdominally obese peers,

although these differences only approached significance. These data suggest that many First Nations children in this community are at increased health risk, particularly for chronic diseases such as T2D and the metabolic syndrome, which are intimately associated with abdominal obesity (Hanley et al., 2004).

Study Two (qualitative) of this thesis was conducted to contextualize obesity and physical activity findings by exploring children's perceptions of lifestyle factors (e.g., health, food and activity). Children in grades four and five participated in focus group interviews from which three themes emerged across the interviews. The first theme *Cultural/Traditional Knowledge* was an umbrella theme that was woven throughout all discussions and was found within the two other themes (*Importance of Family* and *Meaning of Health*). These findings highlight multiple contextual issues associated with childhood obesity and suggest the need for an ecological approach that considers socio-cultural factors, children's perceptions of health, and children's food and activity preferences when designing strategies to promote healthy lifestyles. Our data also underscore the need to integrate First Nations cultural/traditional practices and include parents, elders and the extended family members when developing and implementing strategies to prevent childhood obesity in this First Nations community.

Together, both studies provide a descriptive profile of the elementary aged First Nations children who attend the community school. Our sample was limited to the children who attended the community school, which is not representative of all of the children who live in the community resulting in reduced generalizability

of findings. Nonetheless, the students who participated in the focus groups (Study Two) were from the same cohort of students who participated in the prevalence of obesity and physical activity level monitoring study (Study One) allowing these findings to provide context to what we found in our health assessment.

Ultimately, in creating a profile of children in this community, a disconnect was discovered between children's health status and their preferences for healthy lifestyle choices. It is imperative that future research projects seek answers to why First Nations children have an adverse health profile, even though they make claims to prefer healthy lifestyles. It is possible that the social determinants of health (e.g., geographic isolation, poverty, cultural barriers, education) (Cloutier et al., 2008; Health Canada, 2009; Willows, Veugelers, Raine, & Kuhle, 2009) contribute to this disconnect; therefore, we need to better understand the interactions between these determinants in this First Nations community.

5.2 Contributions, implications, recommendations and future directions

The information presented in this thesis makes a number of very important contributions to the literature in understanding obesity among First Nations children. This thesis is novel because, to date, few studies have used a mixed methods approach to simultaneously assess the prevalence of obesity and physical activity status while exploring children's health perceptions. This is important because as we generated data about children's health status, we also provided information about the context in which these phenomena occurred. Additionally, this thesis advocates for participatory research that gives children a voice to

inform and determine the direction of future healthy living strategies. This is important because children are entitled to express their views on the matters that affect them (Hill, 2006; United Nations, 1989) such as obesity prevention efforts. The community specific information provided by this research is another substantial contribution; it provides valuable data to help inform the design of effective strategies to prevent the development of obesity and chronic diseases among First Nations children living in this community.

Study One reported objectively measured data regarding obesity and physical activity from an understudied population. To the author's knowledge, this was the first study in western Canada to examine the prevalence of obesity, abdominal obesity and physical activity in First Nations children. These data provide us with a more thorough understanding of the relationship between physical activity and abdominal obesity, suggesting that lifestyle interventions (e.g., increasing physical activity) may help to decrease abdominal obesity in First Nations children. These findings also reveal that First Nations children in western Canada experienced a similar prevalence of obesity and obesity-related health risks to their First Nations peers in central Canada. With respect to physical activity, First Nations children in Alberta took a comparable number of steps/day to the greater population of children living in Alberta and in Canada. This finding is important because the prevalence of obesity among these First Nations children is almost three times greater than the Alberta provincial average suggesting the need to explore factors other than physical activity (or different aspects of physical activity such as the intensity of activity or sedentary activities) that

contribute to development of childhood obesity in this population. For these reasons, it is important to develop appropriate strategies to promote healthy lifestyles in First Nations communities across the country; however, the specific approaches required by each community are likely to be unique due to variability in community-level assets, barriers and interconnected socio-cultural factors (e.g., gender, age, ethnicity, traditions, religions, community or social attitudes, beliefs and values) (Swinburn, Egger, & Raza, 1999). From a local perspective, the findings from this study serve an additional purpose in that they could be used to leverage support and resources necessary to develop culturally-appropriate and sustainable programs to address the specific needs of First Nations children living in this Alberta community.

Study Two also makes important contributions to our understanding of First Nations' children's perspectives and preferences for lifestyle choices. The results obtained from focus groups with children offer insight into how First Nations children incorporate aspects of both modern and traditional/cultural lifestyle concepts into their notions of health (Willows 2005; Young, 2003). Our findings suggest that culture and tradition play important roles in First Nations children's lifestyle practices, which speaks to calls for obesity research to explore the intricacies of the relationship between culture and lifestyle practices (Pigford & Willows, *in press*; Willows, Marshall, Raine & Ridley, 2009). Family is also highlighted as having a strong influence on First Nations children's notions of healthy lifestyles. These findings encourage the development of culturally-relevant obesity prevention strategies which engage both family and community

members to be active role models for children. We suggest the following recommendations to facilitate the development of culturally-relevant obesity prevention strategies based on information collected about food and activity preferences from First Nations children living in this community.

Recommendations

- Future childhood obesity prevention strategies need to incorporate First Nations cultural practices and foods, and respect the value placed on cultural knowledge. This is needed because culture plays a fundamental role in the development of First Nations children's lifestyle choices.
 - Program planners should examine existing programs including, the obesity/diabetes prevention strategies developed for Sandy Lake and Kahnawake to elicit examples of how culture was integrated into these projects (e.g., the school curriculum) and apply relevant information to the target community.
- Community members including parents, adult family members and elders should be involved in creating an environment designed to promote healthy weights in First Nations children.
 - It is important for parents and other adults in the community to act as healthy role models to facilitate obesity prevention in First Nations children. This is important because children indicated that their understanding of health is, in part, informed by comments and actions made by adult family members.

- With respect to teaching children about healthy lifestyle practices, the community school can employ a more active role and look to include family and community components in the school curriculum and environment. This is important because children did not include the school as a main source of health information.
 - Future initiatives in the school and community may benefit from teaching children how to use the Aboriginal food guide and by promoting the use of the guide among parents and other adults who cook for children, including grandmothers and the school chef.
 - Bringing elders into the classroom to discuss health could utilize the value placed on cultural teachings while still teaching a health curriculum.
 - Future health initiatives in the school and community may seek to teach children about holistic health concepts associated with the medicine wheel or sacred circle (Turton, 1997; Warbe, 2005).
- Children suggested that they preferred healthy foods; therefore, efforts are needed to ensure that children are provided with healthy hot lunches at school and efforts to advocate for the inclusion of healthy snack food options at the local convenience store are important to enhance dietary quality of children in the community.
- Future research is needed to examine why children are not meeting physical activity recommendations. The next step is for researchers to work collaboratively with the study community to discuss and prioritize

the preferences listed in **Tables 4-1** and **4-2** and establish an action plan to make some of the foods and activities preferred by children available to them.

This thesis also illustrates the added value of conducting community-based research (CBR). Utilizing a CBR approach facilitated the research process and led to unanticipated, positive outcomes. Community engagement throughout the research process enabled active project participation by community members, encouraged collaborations within the community between individuals and departments, and raised awareness of the project. Community awareness prompted by Steering Committee advocacy and the presence of University researchers at community events (e.g., camps and health fairs) fostered community awareness and interest and aided participant recruitment. All of those involved in the research process supported this initiative, which facilitated the dissemination of the research findings to the greater community. The multi-disciplinary composition of the Steering Committee enabled the transfer of knowledge and facilitated the application of findings in the community by community members. For example, in response to school-based reports on the prevalence of obesity and low physical activity status as well as child food preference information, community members began to advocate for the promotion of healthy foods in the community school and the local store. While this was not a specific objective of this research, it demonstrates how this research directly and positively influenced the community. This research offers an example of how

CBR can facilitate community agency, build community capacity (Ritchie, Parry, Gnich, & Platt, 2004) and facilitate social change (Mertens, 2007) in addition to producing knowledge.

It is pertinent to develop culturally-relevant interventions that seek to reduce obesity and abdominal obesity as well as increase physical activity levels to prevent the potential development of chronic diseases such as T2D in First Nations children living in this Alberta community. Based on these data, an ecological approach that emphasizes healthy First Nations cultural practices and multi-level family involvement should be employed to prevent obesity in these children. Prior to this study, elementary aged First Nations children had not been engaged to share their perceptions about obesity-related lifestyle practices. This research illustrated that when provided the opportunity to do so, children can provide valuable insight that can inform the directions of future health promotion strategies. In conclusion, future interventions to promote healthy weights among First Nations children should be participatory, consult children, and utilize an ecological approach that targets change at multiple levels and considers multiple contexts (Birch and Ventura 2008; Plotnikoff, Lightfoot, Barrett, Spinola & Prey, 2008; Pigford & Willows, *in press*).

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422.

6. Appendices

Please Note: To protect the identity of the community information has been removed.

Appendix A

School Letter of Support; Body Size and Physical Activity Measurements

██████████ **Meyo Pematchihiwin (healthy living)**
Project

November 3, 2008

Dear Parents and Guardians,

The ██████████ ██████████ ██████████ is Participating in a Child/Youth Health Project

I am pleased to welcome the ██████████ Meyo Pematchihiwin (healthy living) Project into our school. The ██████████ First Nation has joined with people from the University of Alberta to learn about child/youth health in ██████████.

The study will help us find out if children and youth have a healthy body size, if they physically active, and what children, youth and adults think about health. This information will be used to help plan interventions and/or health programs to give children/youth healthy options.

What is happening in the School?

It is important to know if ██████████ children and youth are a healthy weight and size and if they are active. In November, project researchers will be at our school to measure children and youth and to find out their physical activity levels. School staff will be working closely with the researchers.

How can you help?

This project will be successful if a majority of children take part in the study. Each participant must have a consent form signed by a parent or guardian. If you wish your child/youth to take part in this project please sign the consent form that was given to your child and return it to the school before **Friday November 7, 2008**.

Community involvement

The ██████████ Meyo Pematchihiwin (healthy living) Project has a steering committee that includes members of ██████████ First Nation. This committee reviews all the research for the project. The attached information sheet shows the committee membership. Chief and Council have also reviewed the project and there is a Band Council Resolution supporting the project.

Please read the attached information sheet. This project that will help us to better understand the health needs of our children.

Sincerely,

██████████

School Principal

Purpose: We want to find out if children and youth have a healthy body size and if they are physically active.

Background: Children and youth that have unhealthy body sizes or who are inactive can have health problems like diabetes when they grow up. [REDACTED] (Director of Education) and other members of the [REDACTED] First Nation are working with researchers from the University of Alberta on a project to understand children's health. This information might be used to help develop health programs for children and youth in [REDACTED].

Measurements: We will measure your child's height, weight and waist size. All measurements will be done in private. To make sure that they feel more comfortable, a female researcher will measure girls and a male researcher will measure boys. Two adults will always be present, including a female member of the [REDACTED] First Nation. Children and youth will be asked not to wear bulky clothing (for example, a hoodie). Children and youth will remain clothed but will be asked to take off their shoes for height and weight measurements.

Physical Activity: Students will be asked to wear a small device called a pedometer that will measure how many steps they take in a day. Students will wear the pedometer on their waist band for four days. Each morning, a researcher at the school will write down the number of steps the student took the day before. The student will then get a small prize.

Time Commitment: Recording of pedometer steps and measurements should take no longer than 5 minutes. This will take place during the school day at a time that is convenient for teachers and students.

Benefits: The information might be used to make health programs for children and youth living in [REDACTED]. We hope that this project will increase health, fitness and wellbeing for the participants and their families.

Risks: We believe that the risks of participating in this project are very small. We do not think that participating in this project will harm your child. However, your child may become upset or embarrassed when being measured. If this happens, your child will be quietly taken aside and the testing will stop. If your child wants to talk to someone, they will be able to talk to a community member from the [REDACTED] First Nation. Testing will only begin again if your child decides that they would like to continue.

Confidentiality: All personal information from this project will be kept private. All of the project information will be kept in a Locked and secure office of the researchers at the University of Alberta. Your child's name will NOT be used in any reports or public presentations.

Freedom to Withdraw: Students will be asked if they would like to participate in the study. It is okay if they decide not to participate. They will be able to stop participating in the study at any time.

Contact Information:

You can contact the following people with any questions or concerns about this project:

Any of the research team members or the school Principal:

Geoff Ball PhD (Researcher)
Ph: (780) 407-3784
email: geoff.ball@ualberta.ca

Noreen Willows PhD (Researcher)
Ph: (780) 492-3989
email: noreen.willows@ualberta.ca

David DyckFehderau MA (Project Coordinator)
Ph: (780) 495-8837
email: dyckfehd@ualberta.ca

[REDACTED]

[REDACTED]

If you have any questions about your rights as a research participant, please contact the Health Research Ethics Board at the University of Alberta at: (780) 492-0302

Appendix C

Parent Consent Form; Body Size and Physical Activity Measurements

PARENT CONSENT FORM
BODY SIZE AND PHYSICAL ACTIVITY MEASUREMENTS IN
CHILDREN AND YOUTH

Meyo Pematchihiwin (healthy living) Project: Identifying factors influencing healthy lifestyles in First Nations children: A community-based formative assessment

Principle Investigators: Geoff Ball, PhD, RD (780) 407-3784 (ph)
Noreen Willows, PhD (780) 492-3989 (ph)
Project Coordinator: David DyckFehderau, MA (780) 492-8837 (ph)

Part 2 (to be completed by the research participant):
Yes No
Do you understand that your child has been asked to participate in a research study?
Have you read and received a copy of the attached Information Sheet?
Do you understand that your child will have their height, weight and waist size measured?
Do you understand that your child will have their activity levels measured with a small device called a pedometer?
Do you understand the benefits and risks involved in taking part in this research study?
Do you understand that you are free to withdraw your child from the study at any time, without having to give a reason?
Do you understand who will have access to your child's information, including personally identifiable health information?

Child's Name
I agree for my child to take part in this study: YES NO
Signature of Parent or Guardian (Printed Name) Date
Signature of Witness Date
Signature of Investigator or Designee Date

Appendix D

Child Assent Form; Body Size and Physical Activity Measurements



UNIVERSITY OF ALBERTA

CHILD ASSENT FORM
BODY SIZE AND PHYSICAL ACTIVITY MEASUREMENTS IN CHILDREN AND
YOUTH

██████████ Meyo Pematchihiwin (healthy living) Project: Identifying factors influencing healthy lifestyles in First Nations children: A community-based formative assessment

Researchers:

Geoff Ball PhD, Assistant Professor, Department of Pediatrics, University of Alberta

Noreen Willows PhD, Associate Professor, Department of Agricultural, Food and Nutritional Science, University of Alberta

Project Coordinator:

David DyckFehderau MA, Project Coordinator, Department of Pediatrics, University of Alberta

Why is this study being done? What will the information be used for?

We want to find out if you have a healthy body size and how active you are. This information might be used to develop health programs for children and youth in ██████████.

What do I have to do?

To find out if you have a healthy body size, we will take some measurements of you in private. We will measure your height, weight and waist size. You will have your clothes on when you are measured, but you will be asked not to wear bulky clothing (a t-shirt instead of a hoodie, for example). You will be asked to take off your shoes.

To find out how active you are, we will ask you to wear a small device called a pedometer. This will measure how many steps you take in a day. You will wear the pedometer on your waist band for four days. Prizes are offered each day you return the pedometer.

What if I don't want to be in the study?

Being in the study is completely up to you. You don't have to participate if you don't want to. You can also stop participating at any time.

Will information be kept confidential (private)?

All your information will be kept private. Your name and information will not be shared with anyone not involved in this project.

The final decision to participate in this project must be made by you and your parents. It is OK if you decide not to participate.

Please check (✓) one of the following choices:

I **want** to join this research project _____

I **do not want** to join this research study _____

My name is: _____

Appendix E

Information Sheet; Focus Group Interviews



UNIVERSITY OF ALBERTA

Information Sheet #1a Focus Group Interviews- Elementary School

██████████ **Meyo Pematchihiwin (healthy living) Project:** Identifying factors influencing healthy lifestyles in First Nations children: A community-based formative assessment

Principal Investigators:

Geoff Ball PhD, RD, Assistant Professor, Department of Pediatrics, University of Alberta

Noreen Willows PhD, Associate Professor, Department of Agricultural, Food and Nutritional Science, University of Alberta

Project Coordinator:

David DyckFehderau MA, Department of Pediatrics, University of Alberta

Purpose: We want to find out what your child thinks about health. We want to know what she/he thinks are healthy foods and healthy activities which include traditional foods and activities. We would also like to know more about the health issues that are a concern to the children in the community. We would like to use the information to make more opportunities in ██████████ for children to be healthy.

Background: It is important to know what things children think are healthy and not healthy. We hope to use this information to help improve the health of children.

Procedures: Your child will be asked to participate in a focus group interview to find out what children in ██████████ think of health. The group interview will include 5-8 other students from grades 4 and 5. Children will be asked to draw pictures of (1) the activities they like to do and (2) the foods they like to eat. As a group, children will discuss whether their drawings were of healthy or unhealthy activities and foods.

We will review the drawings individually before the children discuss them. Drawings will not be discussed that might be potentially embarrassing to the students or community members. If your child feels uncomfortable discussing the drawings in a group, he/she does not have to discuss them at all. The research assistant leading the focus group interview will audiotape the group discussions. Afterwards, the research assistant will type the conversation, but they will not include your child's names.

For those children not taking part in the focus group, they will remain in their regular class routine. The researchers will work closely with the principal and teachers to find a time that will be least disruptive to your child. This will ensure that class instruction is not missed or kept to a minimum.

Time Commitment: Group discussions should take about 1 hour.

Benefits: The possible benefits to your child for participating in this study include learning what other children think about health. The focus group process is designed to show that children's ideas are valued, good, and are of interest to the adult facilitators and the project.

The focus group will help us better understand what children think of the assets in [REDACTED], where they play, and the foods they think are healthy. This should help in fine tuning health programs for children living in [REDACTED]. We also hope that this project will increase awareness about health, fitness, and wellbeing for children in [REDACTED].

Risks: We believe that the risks of participating in this project are very small. If your child becomes uncomfortable discussing the topics related to activities and food in a group, she/he will be quietly taken aside. If your child wants to talk to someone, she/he will be able to talk to a community member from the [REDACTED] First Nation. Your child can also choose not to participate.

Confidentiality: The focus groups will not be anonymous because the children will be talking together in a group and we cannot guarantee that children will not talk publically.

Only university researchers involved in the project will have access to the study data, which includes notes and audiotaped information. Reports will be written for the [REDACTED] community and for the [REDACTED] Chief and Council. Some findings may be published in scientific journals or presented at conferences and at community meetings. However, any reports, publications, and presentations from the study will include comments and statements from all participants, not just those from your child. Your child's name will never be used in a document.

One of the Principal co-investigators of the study will keep the data from this workshop in a secure location at the University of Alberta. Data will be stored for

a minimum of five (5) years. Data in paper form will be stored in a Locked filing cabinet. Electronic data will be stored on a computer with privacy protocols (password protected).

Freedom to Withdraw: Taking part in this study is voluntary. It is OK if you decide not to have your child take part. If you agree to this study and later change your mind, you are free to withdraw your child from the study. If your child agrees to this study and later changes his/her mind, your child can withdraw at any time without any consequence. Withdrawing can be done by informing any of the researchers or teachers.

Contact information: Please contact any of the individuals identified below if you have any questions or concerns about the workshop:

Dr. Geoff D.C. Ball	Principal Investigator	Phone Number: (780) 407-3784
Dr. Noreen D. Willows	Principal Investigator	Phone Number: (780) 492-3989
Mr. David Dyckfehderau	Project Coordinator	Phone Number: (780) 492-8837

Ethic approval and third party contact information: The research project has also received ethics clearance through the Health Research Ethics Board (HREB) Panel B of the University of Alberta. If you have concerns about your rights as a study participant, you may contact the Health Research Ethics Board (HREB) Panel B at 780-492-0459. This office has no connection with the study investigators

This study was approved by the Chief and Council of the [REDACTED] First Nation on October 23, 2008 (Band Council Resolution 2008-2009-060).

Funding: This research is funded by the Alberta Centre for Child, Family, and Community Research and by Promoting Optimal Weight through Ecological Research (POWER of the University of Alberta).

Appendix F

Parent Consent Form; Focus Group Interviews



UNIVERSITY OF ALBERTA

My name is: _____

**PARENT CONSENT FORM
FOCUS GROUP INTERVIEWS**

Meयो Pematchihiwin (healthy living) Project: Identifying factors influencing healthy lifestyles in First Nations children: A community-based formative assessment

Principal Investigators:	Geoff Ball, PhD, RD Noreen Willows, PhD	(780) 407-3784 (ph) (780) 492-3989 (ph)
Project Coordinator:	David DyckFehderau, MA	(780) 492-8837 (ph)

Part 2 (to be completed by the research participant):

Yes No

Do you understand that your child has been asked to participate in a research study?

Have you received and read a copy of the attached Information Sheet?

Do you understand the benefits and risks involved in having your child take part in this research study?

Have you had an opportunity to ask questions and discuss this study?

Do you consent to having your child's comments / ideas audiotaped?

Do you understand that you are free to withdraw your child from the study at any time, without having to give a reason?

Has the issue of confidentiality been explained to you?

Do you understand who will have access to your child's information?

Do you agree to be contacted about additional research studies in the future?

Child's Name _____

I agree for my child to take part in this study: YES NO

Signature of Parent or Guardian _____ Date (dd/mm/yy) _____
 (Printed Name) _____

Signature of Witness _____ Date (dd/mm/yy) _____

Signature of Investigator or Designee _____ Date (dd/mm/yy) _____

Appendix G

Child Assent Form; Focus Group Interviews



UNIVERSITY OF ALBERTA

CHILD ASSENT FORM #1a FOCUS GROUP INTERVIEWS- ELEMENTARY SCHOOL

██████████ **Meyo Pematchihiwin (healthy living) Project:** Identifying factors influencing healthy lifestyles in First Nations children: A community-based formative assessment

Researchers:

Geoff Ball PhD, RD, Assistant Professor, Department of Pediatrics, University of Alberta

Noreen Willows PhD, Associate Professor, Department of Agricultural, Food and Nutritional Science, University of Alberta

Project Coordinator:

David DyckFehderau MA, Project Coordinator, Department of Pediatrics, University of Alberta

Why is this study being done? What will the information be used for?

We want to find out what you think health is. We also would like to know more about the health issues that are a concern for boys and girls in ██████████. We will use your ideas to make healthy programs for children in ██████████.

What do I have to do?

To find out what you think of health, we would like you to draw some pictures for us and talk about them. You will be in a group of 5-8 other children from grades 4 and 5. If you are a girl, you will be with a group of girls. If you are a boy, you will be with a group of boys. You will draw pictures of the things you like to do and eat. We will ask you why you like to do and eat the things that you drew. We are also going to ask you to tell us what you think is healthy or unhealthy.

The conversation will be audiotaped, but your name won't be mentioned on anything that gets written. You do not have to answer all of the questions.

What if I don't want to be in the study?

Being in the study is up to you. You don't have to participate if you don't want to. You can also stop participating at any time.

Will information be kept confidential (private)?

All your information will be kept private. We will only report comments and statements from all children, not just you. Your name will never be used in any kind of report

The final decision to participate in this project must be made by you and your parents. It is OK if you decide not to participate.

Please check (✓) one of the following choices:

I **want** to join this research project _____

I **do not want** to join this research study _____

Appendix H

Focus Group Question Guide

Focus Group Questions for First Nations School Children

Workshop Objective	
Through group discussion, identify children’s behaviors and perceptions towards healthy activities and healthy foods which include traditional activities and foods	
STEP ONE: INTRODUCTION AND ICE BREAKER	
Process	
<ol style="list-style-type: none"> 1. Have participants sit in a circle 2. Ensure all participants present have signed consent/assent forms 3. Welcome participants to the workshop 4. Introduce self and co-facilitator 5. Identify the objective of the workshop (see above) 6. Outline guidelines for the workshop 	
<p style="text-align: center;"><u>Guidelines</u></p> <ol style="list-style-type: none"> A. Everyone’s ideas are good and important B. Everyone will have a chance to speak, so let’s be sure that we let people finish their thoughts before adding personal thoughts C. We will not make fun of or laugh at what other people say, no one likes that D. This is a time for each of you to talk amongst yourselves about the topic for this focus group E. I’m here (the facilitator) to help the discussion along F. If you become uncomfortable with what we’re doing, you can, at any time, talk with the community person present and/or leave, you will not get in trouble if you decide to stop participating in the interview 	
Question	Objective
<ul style="list-style-type: none"> • Tell us your name and then tell us about the one thing that you like to do the most, and your favorite food. 	Ensure participants are comfortable by creating a positive and safe environment to encourage participant discussion

STEP TWO: IDENTIFYING ACTIVITIES, BEHAVIORS AND PERCEPTIONS ABOUT ACTIVE LIVING		
Objective		
Identify what participants like to do, the traditional activities they enjoy, and participants' perceptions about healthy activities which include traditional activities		
Process		
<ol style="list-style-type: none"> 1. Give each participant two half sheets of 8 1/2 x 11 inch paper 2. Place crayons, color pencils, and lead pencils in the centre of the table 3. State: Can you draw pictures of two activities you like to do? And write down what you drew 4. State: Remember this isn't a competition and there isn't any good or bad way to draw. Your drawing does not have to be perfect. Just try your best. 		
Question	Possible Probes	Theme
<ul style="list-style-type: none"> • Tell me more about your pictures/drawings 	<ul style="list-style-type: none"> • Why do you like this activity? • When do you do this activity? • Who do you do this activity with? • Are there things that stop you from doing this activity more often? If yes, tell me about them. • What kinds of activities do you like to do that you haven't drawn? • What kinds of activities would you like to do that you can't do? <ol style="list-style-type: none"> a. Why can't you do them? 	Flesh out participants' behaviors concerning the activities that they like to do (including traditional activities) using the drawings as a starting point.
<ul style="list-style-type: none"> • Are there traditional activities you like to do? 	<ul style="list-style-type: none"> • Why do you like that activity? • When is the last time you did that? 	

Process		
As a group, I would now like for you to sort the pictures into two piles, one pile will have what you think are the most healthy activities and the other pile will have what you think are less healthy activities.		
Question	Possible Probes	Theme
<ul style="list-style-type: none"> • How did you decide which activities were healthy and which were unhealthy? 	<ul style="list-style-type: none"> • Where did you learn that? • Did anyone talk to you about what is healthy and unhealthy? Whom? When? • What does the word healthy mean to you? • What does the word unhealthy mean to you? • What makes an activity healthy? • What makes an activity unhealthy? 	<p>Flesh out specific health perceptions towards activity (including traditional activities) using the drawings as a starting point</p>
<ul style="list-style-type: none"> • Are there any traditional activities you would say are healthy? 	<ul style="list-style-type: none"> • Tell me more (Why)? • Are there any traditional activities you would say are unhealthy? • Tell me more (Why)? 	

STEP THREE: IDENTIFYING BEHAVIORS CONCERNING FOOD AND PERCEPTIONS TOWARDS HEALTHY FOODS		
Objective		
Identify the foods participants like and the traditional foods they enjoy, and participants' perceptions about healthy foods which include traditional foods.		
Process		
<ol style="list-style-type: none"> 1. Give each participant two half sheets of 8 1/2 x 11 inch paper 2. Place crayons, color pencils, and lead pencils in the centre of the table 3. State Let's start talking about food. Let's do some more drawing. Can you draw pictures of two foods that you like? Please draw one food per sheet of paper and write down on each sheet what you drew. 4. State: Can you draw pictures of two activities you like to do? And write down what you drew 5. State: Remember this isn't a competition and there isn't any good or bad way to draw. Your drawing does not have to be perfect. Just try your best. 		
Question	Possible Probes	Theme
<ul style="list-style-type: none"> • Tell me more about your pictures/drawings 	<ul style="list-style-type: none"> • Why do you like this food? • Where do you eat this food? • When do you eat this food? • Are there things that stop you from eating this food more often? If yes, tell me about them. • What kinds of foods do you like that you haven't drawn? • Are there foods you would like to eat that you can't have? <ol style="list-style-type: none"> a. What are these foods? b. Why can't you have them? 	Flesh out participants' behaviors concerning food (including traditional foods) using the drawings as starting point.
<ul style="list-style-type: none"> • Are there traditional foods you like? 	<ul style="list-style-type: none"> • Why do you like that food? • When is the last time you had it? 	
Process		

As a group, I would now like for you to sort the pictures into two piles, one pile will have what you think are the most healthy activities and the other pile will have what you think are less healthy activities.		
Question	Possible Probes	Theme
<ul style="list-style-type: none"> • What makes a food healthy? • What makes a food unhealthy? 	<ul style="list-style-type: none"> • Where did you learn that? • Did anyone talk to you about what is healthy and unhealthy? Whom? When? 	Flesh out specific perceptions about healthy food (including traditional foods) using the drawings as a starting point
<ul style="list-style-type: none"> • Are there any traditional foods you would say are healthy? 	<ul style="list-style-type: none"> • Tell me more (Why)? 	
<ul style="list-style-type: none"> • Are there any traditional foods you would say are unhealthy? 	<ul style="list-style-type: none"> • Tell me more (Why)? 	
STEP THREE: CLOSING REMARKS		
Question	Objective	
<ul style="list-style-type: none"> • Any more quick thoughts to add? • Would you mind summarizing your thoughts for us? 	Summarize and thank everyone for their time	