MEASUREMENT OF DETERMINANTS OF HEALTH IN ELEMENTARY SCHOOL CHILDREN

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INTRODUCTION

In an attempt to ascertain the health status of a cohort of elementary school children a determinant of health study was undertaken from October 2004 to June 2005. It was hoped that by knowing the current health status of the children it would provide a lens for the researcher to assess the potential future development of chronic diseases of this group. Under the premise that the development of healthy lifestyle practices early in childhood decreases the risk of future development of chronic diseases, **the primary purpose of this study was to measure the health status of this cohort of elementary school children, to determine the prevalence of risk factors associated with the future development of chronic diseases.**

This research project measured health status with both physiological and descriptive indicators. Physiological measurements included height, weight and blood glucose. Health behaviours were measured by using a questionnaire to determine the children's perceptions of their health practices. Since health behaviours learned early in life are usually maintained and persist into adulthood, the rationale for this study was the supposition that the earlier exposure to an environment supportive of healthy behaviours the better. Indeed health practices may be altered over the course of life but generally if learned early they are entrenched into daily practice.

Health behaviours were measured with the administration of an in- school questionnaire based on the determinants of health indicators. The questionnaire measured health practices that consisted of: sleep habits; screen time/activity after school and on weekends; physical activity with and without family; nutrition practices and choices; and reading at home. This was an attempt to ascertain the social networks and environments of the children, their personal practices and those of their families, exposure of the children to environment supportive of healthy behaviour development, and exposure to books and reading.

Physiological variables included height, weight and blood glucose levels. These results provided a basis for determining potential current risk factors for developing future disease. Serum glucose levels screened for elevated levels that assisted in detecting risk of development of or diagnosis of type II diabetes. Height and weight were plotted on the Center for Disease control growth charts. Body mass indices were not used in this study to ascertain the children's health. The researcher was interested in knowing the children's perceived health practices as opposed to using a quantitative scale to state health status. With the controversy surrounding the accuracy of body mass indices in children as well as the sensitive nature of weight, body mass indices were calculated for parent's information only and not for the purpose of this research. However, blood glucose levels were chosen as children had previously been screened for this and were possibly less intimidated by this method of screening.

Limitations of this study were: 1] Questionnaire validity; 2] sample size; 3] choice of behaviors and biological factors to measure; 4] methods of measurement of physical health; 5] human resources; 6] parental involvement; 7] accuracy of children's reports of their health behaviors not measured against parents reports; and 8] reluctance of some children to participate in blood screening process.

The questionnaire was initially designed to reflect the developmental ages of the different groups of elementary school children. The children were grouped into two groups grades K-2 and 3-5.The K-2 questionnaires used pictures to offer visual representations of possible responses. However, the pictures were possibly distractions and limited the response choice. As for the content of the K-2 questionnaire there was definitely a difference in reading ability and comprehension between the kindergartens and grades one and two group, so the kindergartens did not have the survey administered to them. For example, it was difficult for the kindergarten students to understand the concept of time i.e. "how often?" when ascertaining frequency of a behavior. Another limitation that was consistent for both groups was that the questionnaire was not piloted. This was a result of lack of time, and human resources and lack of experience of the researcher.

Without validation of the children's responses with other adults, such as parents, it was difficult to interpret the response sets as valid. Therefore the data collected on these descriptive indicators cannot be viewed as accurate. However, the responses from the sample could be either the children's actual "perceived" behaviors or those that they thought the researcher wanted. Unfortunately, without this validation the responses are left open to interpretation.

The sample size was limited to allow for a convenience type sample, which would ensure a high rate of attendance and participation as well as to make it easier to disseminate results and answer questions from parents. This cohort was a sample of the larger community of children aged 5-10 years of age attending the school in the community.

The measurements chosen by the researcher did not use current suggested practices i.e. in lieu of height and weight measures [BMI], hip-waist ratio and or blood pressure and heart rates before during and after physical activity could have been the methods of choice. Also, a lack of parental involvement in screening days, although encouraged by the team, could have helped in supporting the education provided in the screening clinics at home and out of school.

A final limitation was the reluctance of some children to undergo initial and or two-hour blood glucose screening that limited the final sample size.

LITERATURE REVIEW

OVERVIEW

Health outcome is a function of exposure to the determinants of health. Early childhood experiences and exposure to these predictors affects the health of an individual later in life. Healthy lifestyle practices developed at an early age can prevent future chronic disease. The early establishment of healthy behaviors in children that promote making positive lifestyle choices can accomplish this.

The determinants of health are those factors that foster the development of these behaviors. For example, exposure to a diet high in fruits and vegetables at an early age generally predicts a similar diet into adulthood. However, it is only a predictor. Determinants of health are factors that affect all people but at varying degrees; these are at the core to fostering health. The determinants of health consist of: Income and social status; social support networks; education and literacy; employment and working conditions; social environments; physical environments [food, water /air/soil quality, waste disposal, animal and insect vectors, drugs]; personal health practices and coping skills [psychological characteristics such as personal competence, locus of control, and mastery over one's life contribute to physical and mental health]; healthy child development [early childhood experiences important in the development of coping skills and competence]; biology and genetic endowment; health services; gender; and culture [Shah,2003].

In relation to children's health this study explored two of the key determinants of health: 1.healthy child development; 2.and personal health practices. Healthy child development is influenced by early childhood experiences. For example, a child's health is directly related to nutrition, sleep, stimulation, education, physical activity and access to medical care [Public Health Agency of Canada, 2006]. Personal health practices are determinants that are psychological characteristics that begin to develop early in life. These include personal competence, locus of control and mastery over one's life. They contribute to mental and physical health [Shah, 2003]. These characteristics are developed early in life as a result of the influence of a child's environment such as family physical and nutrition practices, housing, neighborhood, family income, level of parental education, access to medical care and genetics [Public Health Agency of Canada, 2006]. The other determinants of health are also integral to children developing positive behaviors about lifestyle practices but are beyond the scope of this research.

Health status as defined by Shah, 2003, is "the degree to which a person is able to function physically, emotionally, socially with or without aid from the healthcare system" [p.72]. Indicators used to evaluate health status include self-rated health, incidence of chronic disease, physical measures such as height, weight, BMI etc. Indicators used to ascertain exposure to non-medical determinants of health are heath behaviors, environmental factors, personal resources and living and working conditions.

CHRONIC DISEASE

Poor health practices contribute to the development of chronic diseases. Chronic non-infectious diseases such as cardiovascular disease, type 2 diabetes and cancer are the leading cause of death and disability in Canada and worldwide. [Shiell, 2004]. Data from the 1998/99 Canadian National Diabetes Surveillance Strategy [NDSS] indicated that the rate of adults diagnosed with type II was approximately 4.8%. However, it has been suggested that in the general population the true prevalence is actually >7%. [Canadian Diabetes Association Clinical Practice Guidelines p. S1] .The morbidity and mortality rates associated with diabetes are increased as a result of complications such as heart disease, stroke, vision impairment or loss, renal and neurological diseases.

Of all the complications of diabetes, for example, cardiovascular disease was estimated to be the most costly. Cardiovascular disease is complication of Type II diabetes. It is also associated with lifestyle behaviors. In September 2004 researchers at McMaster University and the Hamilton Health Services in Ontario released the findings from the INTERHEART study, an international study of 30,000 people from many ethnic and cultural backgrounds. The Interheart team began this study to develop a global strategy to prevent cardiovascular disease. The study found 9 risk factors that account for 90% of the worlds' cardiovascular disease. These include smoking, hyperlipidemia, hypertension, diabetes, abdominal obesity, psychosocial factors, lack of fruits and vegetables, lack of physical exercise and level of alcohol consumption. These results were consistent in every region, ethnic group, gender and age groups that were studied. The INTERHEART study stated that a combination of modification of lifestyle practices could lead to an 80% reduction in the risk of heart attacks [Yusef et al, 2004].

Alteration at anytime in life of lifestyle behaviors produces positive effects on health however instilling these practices early in life decreases risk for ill health.

NUTRITION PRACTICES

Nutritional practices are a predictor of a child's health as nutritional habits learned early in life are continued into adulthood therefore directly affecting an individual's health status. Children's nutrition practices are mirrored with their parents. For example, from the Canadian Community Health Survey [CCHS] 2000/01 it was noted that if parents ate fruit and vegetables five or more times per day so did the youth aged 12-19 years [Carriere, 2003]. This also supports the important role that parents' health practices in general are influential to the child. Research suggests that "children who have parents who are obese or overweight are likely to be overweight or obese" [p.31] and that parental health practices could be risk factors for determining health outcome. The CCHS demonstrated an association with parental behaviors and children's behaviors for not only eating fruits and vegetables, but also with leisure time, smoking and physical activity.

Margot Shields in her 2004 review, "Nutrition: Findings from the Canadian Community Health Survey" found that children and adolescents who ate fruit and vegetables 5 or more times per day were substantially less likely to be overweight or obese than those

who ate less.59% of the children and adolescents reported eating less than 5 servings of fruit and vegetables daily. With the increase in fast food consumption and 41% of Canadian children reporting to eat less than the recommended servings of fruit and vegetables it pairs well with the increase in weight of Canadian children.

It is not only what children eat and how much they eat but family and environmental factors that may predict their nutritional practices. In a study by Taylor, Evers and McKenna, in 2005, "Determinants of Healthy Eating in Children and Youth", the authors provided a review of the social determinants that affect healthy eating. These factors included culture, family, peers and product marketing. Exposure to food, availability of food, meal structure, family meals, parenting style and food socialization practices all contribute to the development of healthy eating practices .Of important consideration is that children develop dietary patterns within the context of the family. There is an increasing recognition that food intake and eating patterns, rather than specific nutrients, play important roles in health and disease prevention.

One eating pattern that can be assessed is scheduled meals such as breakfast eating. Eating breakfast as a healthy practice is recommended but are children actually adopting this habit? Taylor et al, 2005, confirmed that less Canadian children eat breakfast and quality food, as do American counterparts. Contributing factors to weight gain include lifestyle and structure of meals [James, 2005]. So, skipping a meal, such as breakfast, lends itself to contributing to poor lifestyle habits. Numerous studies have demonstrated that overweight adults are more likely to skip breakfast than individuals who are not overweight. In a study of 24,363 children in the Nationwide Food Consumption study from 1965-1991 there was a positive relationship found between breakfast skipping and self reported BMI. These analyses were based on self-reports of children and therefore the credibility of the reports was questioned. However, in many studies of adults self reports the same relationship has been demonstrated even after controlling for dieting behaviors. It should be noted that without actual longitudinal studies it is difficult to conclude a relationship but the research does indicate a strong correlation between eating breakfast and BMI. Breakfast skipping is associated with risks such as poor nutrient intake and poor cognitive function and therefore is an important concept to consider in early childhood health [Ritchie, Welk, Styne, Gerstein, and Crawford, 2005].

In a qualitative study by Hesketh, Waters, Green, Salmon, and Williams, in 2005 of grades two and five children and parent views on barriers to healthy lifestyle a theme that emerged was that both children and parents knew what foods were healthy but that was not what the children chose to eat .In this study clearly knowledge of the children or parents was not the obstacle. Parents stated that media marketing and demands of lifestyle were deterrents to providing a healthy diet. Demands of lifestyle decrease the necessary time to plan meals and eat as family at home.

A review by Stockmyer in 2001 discussed that several studies have suggested that foods obtained away from home, take out or fast food, have lower nutrient content. Foods prepared at home generally have higher levels of fiber, calcium, iron, and less total fat, saturated fat, cholesterol and sodium. Therefore, the quality of the foods away from home are less healthy and diets low in these nutrients are associated with risk factors for developing heart disease, diabetes and other chronic diseases. Stockmyer also reviewed

the amount of food eaten away from home and family practices associated with this choice. The author stated that there had been a change in the percent of food budget of an American family spent on food away from home. In 1998 it had increased to 47% from 25 % in 30 years. Many factors were suggested that contribute to this increase ranging from the increase in working mothers to higher incomes to increased affordable fast foods and advertising.

The role of the family in developing health meal and nutrition practices is paramount. In 2001 Young and Fors examined the influence of selected family characteristics in eating breakfast, lunch and fruits and vegetables. They administered a survey to 3155 high school students. They found an association with increase in grade and decrease in eating a healthy breakfast. Another finding was that higher fruit and vegetable intake was associated with increased family communication. This study identified family factors that act as "protective" factors to ensure adequate fruit and vegetable intake and healthy breakfast and lunch intake. This study confirmed previous research that has demonstrated a strong association between eating fruit and vegetables and family "connectedness" [p.485]. All in all these implications suggest that family is a key component in developing and maintaining healthy nutrition practices

PHYSICAL ACTIVITY PRACTICES

Physical activity being a personal health practice is an important predictor in health status and prevention of chronic disease.

The July 6, 2005 edition of The Daily titled "Canadian Community Health Survey: Obesity among children and adults" reported on the results from the CCHS. It stated that being less active and eating less fruits and vegetables increased the chance of being obese. Leisure time spent in sedentary pursuits was also found to increase the chance of becoming obese. This report stated that for 6-17 year olds with an increase in time spent watching TV; playing video games and computer, they were more likely to become overweight or obese.

Canada is not the only country with concerns about physical activity levels of children and the population. The World Health Organization position statement on Physical activity taken from the WHO website June 2005 discussed the global state of affairs regarding physical activity and health status in the world. It stated that daily physical activity along with other health behaviors [not smoking, having a healthy diet] prevents chronic diseases. The report discussed not only the physical benefits of physical activity but also the social and mental health aspects. Physical activity promotes positive interactions with functional capacity, social interaction, social integration and a healthy diet.

The World Health Organization discussed the many beneficial outcomes of daily physical activity. It stated that: Physical activity increases glucose metabolism and thus decreases diabetes; decreases blood pressure and decreases body fat and weight, thus decreases cardiovascular disease; and has beneficial effects on stress, depression and anxiety. In

conclusion, WHO prepared a Global strategy on Diet, Physical Activity and health to deal with the seriousness of this health issue.

A variety of Canadian health surveys have demonstrated the levels of physical activity of Canadians. In September 2004, The Canadian Population Health Initiative released a report titled: "Improving the Health of Canadians". This report reviewed data collected from the Canadian Community Health Survey [CCHS] 200/01 and the National Population Health Survey [NPHS] 1998-99.From this data analysis 56% of Canadians reported to be inactive! The NPHS found that for ages 12-19 years of age there was an increase in physical activity from 1994-2001.Over the period 1995-2000 the amount of time spent on physical activity increased for ages 1-4 and 5-12 but not for teenagers. For example, 1-4 year olds reported 29 hours per week in activity, 5-12 year olds 16.5 hours and teens reported 14 hours. However, the report stated that 12-19 year olds are still not "sufficiently" active [p.121].

Other data reviewed in this document was taken from the General Social Survey in 1998 that cited TV viewing as the primary leisure activity for ages greater than 15 years at an average of 15 hours per week [approximately 2.2 hours per day] compared to 7 hours per week in leisure time. Another area studied was walking to school/work activities. In 1998, 37% of children aged 5-13 years of age walked to school and 2-4 % cycled. When parents were questioned why their children do not walk or cycle to school they stated that the "distance" from the school and "safety" concerns were the primary reasons.

Activity of children early in life is necessary for the development of this behavior into daily practice and to ensure it is adopted throughout life. In a 2003 report prepared by Perez for Statistics Canada titled "Children Who become Active" factors associated with children aged 4-11 years becoming and remaining active were examined. The premise of the article was that being overweight as a child increases risk of developing chronic diseases as an adult because individuals who are overweight as children will more than likely than acceptable weight children become overweight as adults.

To investigate the activity levels in Canadian children, Perez utilized data from the National Longitudinal Survey of Children and Youth [NLSCY] 1994-1995 cross sectional data and longitudinal data from cycles 1, 2 and 3 that included the years from 1994-1999 inclusive. The data analyzed sex, age and activity as predictors of adopting and maintaining an active lifestyle. Results showed that for overweight or obese children a high predictor of becoming and staying active was having physical education classes at school. Also, watching greater than 2 hours of TV per day lowered the odds of these children adopting and maintaining an active lifestyle. The results did not show a significant affect for the same on acceptable weight children.

With the adoption of the philosophy that being active and not focusing on actual physical fitness or exercise is perhaps of utmost importance for children to learn, Pescatello, 2001,discussed the health benefits of lifestyle physical activity as opposed to exercise or physical fitness .The author defined physical activity as a behavior rather than an "attribute"[p.114]. Many studies have shown the effect of everyday low-moderate physical activity on Cardio metabolic health. Such benefits include glucose homeostasis and lowered blood lipid-protein levels, abdominal fat distribution and blood pressure. The

paper discussed the concept of "lifestyle physical activity" defined as "the daily accumulation of at least 30 minutes per day of self-selected activities, which includes all leisure, occupational, or household activities that were at least moderate in their intensity and could be planned or unplanned activities that are part of everyday life"[p115]. For children these activities could be playing outside, walking to and from school, community events or a friend's house or as simple as playing tag. Lifestyle physical activity as opposed to physical fitness or exercise offers convenience and individual preference which may be more successful because they are more motivating .The author concluded that the amount of exercise necessary for health benefits is less than required to be physically fit.

The importance of daily physical activity is indisputable; however the variables that predict that children will adopt healthy lifestyle approach to physical activity in their lives early on are uncertain. Kohl and Hobbs [1998] reviewed the literature for evidence of potential determinants of physical activity in children .The author's premise was there was a lack of data that tracked physical activity behaviors into adulthood and as a result divided the literature into Three main determinant groups. They were: physiologic and developmental; environmental; and psychological /social/demographic. The conclusion from this review was: that antecedents, predictors and determinants of behaviors are likely affecting physical activity behaviors; that they are influenced by a combination of these factors; and they were not influenced by a single entity. The authors suggested longitudinal research is needed with a multivariate approach to determine the complex interactions of these determinants.

These variables that interact in children's lives are the determinants of health. These factors are entangled into a web that shapes the child's health practices. With respect to factors or influences on physical activity behaviors, the context of the family was explored. Soubhi, Potvin and Paradis [2004] examined just that: the relations between family environment and parents leisure time. This was accomplished by completion of questionnaires of parents of grade 4 children in a sample size of 1136 spanning from rural, suburban to urban place of residence. Although it was a cross sectional study and therefore cannot support a causal relationship, the results support the usefulness of a global view of family health behaviors. Other studies have supported the concept that Differences in exercise behaviors among families have been related to family structure and development stages and ethnic and cultural differences that influence physical activity. The outcome of this particular study showed that there may also be a differential effect of various family's interpersonal interactions, values, beliefs and orientations outside world that affect leisure time behaviors.

SLEEP HABITS

Sleep is an important health indicator as it provides restoration to the body and mind to enable it to function adequately. A review of the literature has linked the effect of quality and quantity of sleep on health and behavior.

From birth onward there are various developmental stages of sleep. Therefore the recommended quantity of sleep alters as a child grows. At school age most children need at least 9 hours of sleep. Taras and Potts-Datema [2005] reviewed literature on the association between sleep among school aged children and academic outcomes in an attempt to address the health of children .The criteria for the research review were: children aged 5-18 years; current publication of article; peer reviewed; and included one of the outcomes –school attendance, academic achievement, cognitive ability, and attention. A conclusion from the author's literature review was that there is enough evidence to justify that poor sleep may be a contributing factor to learning and attention concerns. They suggested further research be done on questioning parents about the child's sleep habits such as regular schedule, duration, resistance at bedtime, night waking, problems with breathing during sleep and daytime sleepiness.

Other articles reviewed by the above authors showed specific findings. For example, Kahn and Van de Merckt and Rebuffat, 1989, had parents of grade 3-5 complete survey about their children's sleep habits and their schooling. The results demonstrated that among the "poor" sleepers [those reporting sleep difficulties for more than 6 months] 215 failed one year of school. This was significant higher than those who did not have sleep problems.

Meijer, Habekothe and Van Den Wittenboer, 2000, studied students from ages 9-14 years through classroom questionnaires regarding sleep. The results showed that 15% reported sleep problems, 435 have difficulty getting up and 25% did not feel rested. Further analyses showed that sleep characteristics had a significant impact on children's motivation in school.

So, the literature supports the importance of sleep, the amount necessary for performance, motivation and perhaps energy levels of children. Roberts, Roberts and Chen, 2001, in a large school based survey with a sample of 5423 students in grades 6-8 examined the association between levels of functioning and symptoms of insomnia and hyper insomnia [sleeping too much]. The authors found that reported illness absence from school was significantly increased with those who reported sleep problems.

Iglowstein, Jenni, Moinari studied the length of sleep for children from infancy to adolescence and Remo in 2003.The study entailed a sample size of 493 from the Zurich longitudinal study. A questionnaire was used to gather parents' reports of their children's sleep. From this cohort percentile curves representing sleep duration based on developmental and age specific were developed. For example, for school aged children from 5-10 years of age the mean length of sleep was reported by parents to be 10-11 hours respectively with the ranges from 9.5-12.5 for 5 year olds to 8.5-11 hours for 10 year olds.

The role of sleep in a child's environment affects the child in developing healthy practices such as school motivation, attendance and learning. Thus setting up positive sleep habits in children fosters education, literacy skill development and in general healthy positive environment.

LITERACY

A non-medical determinant of health is literacy. The ability to read, write and comprehend is a crucial attribute to the development of a healthy lifestyle. Literacy affects health in both direct and indirect ways [Gillis and Quigley, 2004]. An example of how literacy directly affects health is having the ability to read and comprehend health information so that positive, informed health decisions can be made such as medical treatment options or prescription drug information.

Less obviously but just as or more profound are the indirect results of being literate. In a report "How does literacy affect the health of Canadians?" prepared for Health Canada by Perrin in 1998, some of the indirect effects are: living and working conditions [poverty, dangerous environments]; personal health practices and coping skills, [stress, vulnerability and control, healthy lifestyle practices]; physical environments, health services [health information, inappropriate use of health services]. For this report, the author-reviewed Canada's major surveys such as National Population Health survey 1994-95, the Health promotion Surveys 1990 and 1985, as well as literature from The Literacy Partners of Manitoba [1997] and the National Literacy and Health program of the Canadian Public Health Association.

Regarding healthy lifestyle practices there is evidence to link literacy with these behaviors [Perrin, 1998]. People with high levels of literacy are more likely than others to practice healthy behaviors such as not smoking, healthy diet, physical activity and other health practices. Perhaps with low level of literacy there is a lower chance of understanding the importance of healthy behaviors.

The literature supports the importance of literacy skills in health status but what of the importance of early exposure to a literacy rich environment? Children's exposure to both books in the home environment and shared reading will likely influence the development of positive literacy skills. Learning to read is an integral developmental milestone for children [Kuo, Franke, Regaldo and Halfon, 2004]. The chances of doing well academically are linked to literacy. In this study a sample of 2068 parents were asked about reading frequency to their child aged 4-35 months in the National Survey of Early Childhood Health. Reading frequency was obtained from asking parents how many days in a week they read to their child. Over 52% of the children were being read to everyday with 275 being read to 6 times per week and 155 were read to 1-2 times with 6% never read to. It was also found that 215 of children have 10 or less books in the home. The authors concluded that this amount of reported reading time was less than optimal and that families with fewer books read less to their child.

The importance of reading but also of book sharing or being read to was also an important concept when evaluating children reading in the home. Bus [2001] supports the concept that sharing a book between a child and parents promotes language development and assists in the development of emotional attachment. Therefore parents reading to their children and having access to books are important factors in the healthy development of children.

The "Reach out and Read" program by Bailey and Rhee, 2005, addressed the concept of

instilling in parents a desire to read to their children at an early age and provide the necessary resources for them to accomplish this by having health practitioners trained in literacy development with children, providing books to children to take home and by providing rich literacy environments in community settings/ waiting rooms. This project was a nationwide intervention with the goal to have all children reading at grade level by school entry.

The development of literacy skills early in a child's life are indeed imperative to the fostering of health outcome in the child's future by increasing literacy levels that theoretically increase educational attainment, self esteem, income level, access to adequate health services and the comprehension of healthy practices which results in healthy outcome.

METHODS

SETTING

The setting was a Maliseet First Nation community nestled within a city on the banks of the Saint John River .The city's population is approximately 60,000.The population of the community is approximately 850. All of the community members are not of Aboriginal descent. The community is lead by an elected Chief and eleven councilors.

There is an elementary school [K-5]. In the community Approximately 50 % of the children in this age group attend this school with the others attending a variety of elementary schools in the city. Initially in 2002, there was not any nutrition policy, daily physical activity or education programs. With the initiation of the Aboriginal Diabetes Initiative [ADI] a Healthy Lifestyle program commenced in 2003. The community health nurse and representative in partnership coordinated this with the ADI Community Consultant. The children had recess in the a.m. and were encouraged to play outside on the playground. At lunch they would play outside again if they stayed at school for lunch. Some children went home for lunch. The mode of transportation to and from school was mainly by the community bus. All students go "off" reserve to attend Middle and High school.

SAMPLE

The sample for this study was determined by a non-probability convenient method i.e. the children attending the school on reserve were the sample for this population since:

1 They were easily accessible for the testing i.e. already in attendance at the school where the measurements will take place.

2 Consent and information packages were easier to send to parents through the school i.e. sent home with the students

3 Consents from parents were easier to manage as they could be returned to the school with the children to ensure a high percentage of return.

4 This would ensure a higher rate of turnout/participation as transport and accompanying to the testing site would not be required would not be issues

A total of n=46 children participated in the fall [K-2 22; Grades 3-5=24] and 51 in the spring [K-2=21; Grades 3-5 =27]. Some of the children participated in only the physiological measurements or the questionnaire based on either absence from school for one of the sessions, or refused to participate for the entire screening i.e. both questionnaire and screening.

INFORMED CONSENT

A letter of information and two copies of the consent form were sent to the parents and/or guardians from the school approximately 2 weeks prior to the screening. Those wishing their child to participate signed and returned one copy of the consent form. Children were also invited to sign the consent forms (assenting to participation).

Children and their parents were informed in writing via the information package sent home that participation is entirely **voluntary**, and there would be no penalties or repercussions for either the parents or the children for not participating.

The children were told about the screening project in class. Any children that did not wish to participate, even if their parents had signed the form, that wish was respected. Again, since a free breakfast is provided in the school to all children who arrive without having had breakfast, as part of the "Breakfast for learning" program, the breakfast provided was not coercive.

RESEARCH INSTRUMENT

The students were asked to complete a health pencil and paper questionnaire. Please see attached copies of "Happy Healthy Me" [Appendices B and C]. Questionnaires were designed for two groups of students: one for grades K-2 and another for grades 3-5.The questionnaire surveyed physical activity, leisure time, nutrition, sleep practices and family time .K-2 questionnaire had items that included categorical responses with visual supports. This was done twice during the school year. Grades 3-5 survey had items that required an ordinal, categorical response set. The first administration was in October, in conjunction with the initiation of the physical activity and healthy lifestyle programs at the school, and the second again in June 2005.For k-2 the children were interviewed together in groups of two. In grades 3-5 the children were able to self-administer the questionnaire however the researcher was available to answer questions.

PROCESS

This research measured fasting and two hour post meal blood glucose levels and height and weight in children at the CHSMES at St. Mary's First Nation. Children were recruited from the elementary school via an information package that was sent home to their parents. The Community Health Nurse in class informed the children of the project verbally. Parental consent was required and only those returning a signed consent participated. Parents were encouraged not only to attend the screening day but also to call the Community Health Nurse with any questions or concerns.

The testing was done at the school by registered nurses using blood glucose meters, Accuchek Advantage by Roche Diagnostics. These glucometers were new and calibrated. A capillary sample from the finger of each participant was measured for blood glucose. The children fasted overnight prior to coming to school in the morning, and once their test was completed, they were given a measured breakfast of their choice i.e. 80 grams of carbohydrates. Two hours later, the children were tested again for blood glucose. The staff and students were informed that the participants were not to eat or drink in between tests. In June 2005, only fasting, ac, glucose levels were measured, as per CDA recommendations. If a student's fasting glucose was >/ 5.7 mmol/L they were provided an 80 gram carbohydrate breakfast and told to fast afterwards. Two hours later blood glucose was repeated.

Height was measured to the nearest 0.1cm with a wall growth chart. Weight was measured with SECA optima 760 scales to the nearest 0.1kg. The same researchers, glucometers, scales and wall growth chart were used at each screening, both in the fall and spring. Questionnaires were developed by the researcher and supervisor. They were administered by interview in groups of two, with the Grade 1 and 2 classes and in class as a large group for grades 3, 4 and 5. The questionnaire was not administered to the Kindergarten students, as it was not deemed developmentally appropriate.

To ensure confidentiality in the data analysis the children's results were coded. Parents were informed, via a letter after testing, about their child's results. If any child was found

to have results from outside the acceptable range, the community health nurse contacted the parents or guardians. For program evaluation, presentation and/or publication, identities were not revealed, and all reports were anonymous.

Also the results are kept under security with the Community health Nurse and the results will be kept for seven years in the children's regular medical charts at the Health Center; these medical records are safeguarded, and confidentiality maintained.

The proposal was approved by the Ethics Committee in the Department of Graduate Studies [Public Health] at Lakehead University AND University of New Brunswick. Support was received from the school principal, teaching staff, health director and the Chief.

RESULTS

Analysis of the questionnaire and physical measures was done independently by calculating statistical measures for the physiological results and by grouping themes into a qualitative report on the summary of the questionnaire findings. Due to limitations previously discussed the 'story" of the children's perceived health behaviours was told. As the validity of the responses was questioned along with the small sample size the research question was not answered. However, the collection of this data will be reflected back to the school, parents, children and community in a way to share the research process, the general themes of the results and suggestions for possible future research. For analysis purposes the cohort was sub divided into two groups: 1.kindergarten, grades one and two; and 2. grades 3, 4 and 5.

SURVEY RESPONSES

GRADES 1 AND 2

As noted previously, only grades 1 and 2 responded to this survey [Appendix B]. A summary of the survey results included categorizing the responses into four themes. For these Grades, questions 1, 2, 3, 4, 7, 8,11and 12 were the chosen responses. The themes that emerged were: after school activities [Q1, 2,3,4,7]; Nutrition practices [Q12]; Sleep habits [Q11]; and reading habits [Q 7 and 8]."Screen time" is defined as TV, computer or video games.

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AFTER SCHOOL ACTIVITES

The number of children who participated in the questionnaire was 14[n=14]. The questionnaire had a total of 17 items with response choices ranging from yes or no, more than and open ended. The questions that were taken to analyze from the questionnaire included:

- **Q1.What do you do after school? [3 possible multiple responses: TV, computer/video games, play]**
- **Q2.What do you do on weekends? [3 possible responses TV, computer/video games, play]**
- **Q3.What other things do you like to do when not at school? [Play outside, TV, paint/draw]**
- **Q4.Do you watch TV everyday? [Yes or no]**

Total screen time [included "TV, computer and video games"] was reported to be greater than "playing with or without friends". Only 2 participants stated they watched TV as an after school activity but 6 stated they played on the computer or video games. However, for weekend activities most children reported to watch TV or play computer or video games. No one stated they "played"!

When questioned what other things they like to do when not at school most chose "drawing/ painting /arts and crafts" compared to "play outside" and "TV", which were equal. Most children said they watched TV daily.

Other questions from the survey that were not analyzed as a result of wide variety in answers and questionable validity of the responses were:
Q5.How many TV shows do you watch everyday?
Q6.**Which TV shows do you watch**?
Q9.What do you like to do with your family?
Q10. How do you get to school?

READING PRACTICES

Q7.Do you read books at home? [Yes or no]
Q8.Do you read with someone? [Yes or no].

With respect to reading when not in school, most said they did not read at home. However, this set of responses conflicts to the results in Q8 where most stated that they read with someone!

SLEEP HABITS

Q11.When is bedtime?
Bedtime ranged from 8-12 pm, with 8 and 9 0'clock being the more frequent bedtime reported. Other bedtimes were 10:00 [1response]; 11:00 [response1]; and 12:00 [2 responses].

NUTRITIONAL PRACTICES

All responders stated that they eat breakfast before school.

Other questions from the survey that were not used for analyses were:
Q13. What do you eat for breakfast?
Q14. What do you eat for snacks?
Q15.How often do you eat chips, pop or candy?
Q16.Most days what do you eat for supper?
Q17.How often do you eat foods like McDonalds, KFC, Pizza delight, burger, fries and pizza?

SPRING 2005

Once again kindergarten did not respond to this questionnaire.
Sample size for this set was 14 as in the fall [n=14]. The same 4 items were analyzed as for the fall.

AFTER SCHOOL ACTIVITES

Total screen time [TV, computer and video games] reported was greater than playing with or without friends. This was the same as the responses in the fall. Only 4 stated they played.

In the fall all of the children stated that screen time was their weekend activity. However, in the June data set the children reported to play [10] on the weekends.
Other things the children said they liked to do when not in school were drawing /painting and doing /arts and crafts compared to play outside and TV which were reported almost equally as often.
Slightly greater than 50% said they do not watch TV daily. This was opposite to the fall data, which showed responses for yes to be higher.

READING PRACTICES

Most children said they did read at home. More children reported to read at home in the spring survey than the fall. Most said someone read to them at home.

SLEEP HABITS

The children reported that Bedtime ranged from 8-12 pm.
8 and 9 0'clock was the more frequent bedtimes reported. Other times were: 7:00=1; 10:00 =3; and 12:00=2

NUTRITIONAL PRACTICES

Most responders stated that they eat breakfast before school.

GRADES 3-5

FALL 2004

The survey was answered independently to these students with the administrator in the room for assistance with reading. The sample size was 26[n=26]. The following questions were chosen to analyze and grouped accordingly. Once again the same four central themes emerged as for the grades 1 and 2.They were: after school activities; reading; sleep habits and nutritional habits.

AFTERSCHOOL/LEISURE TIME

- **Q1.After school most of the time do you:** [7 possible multiple responses TV, talk with friends, play outside, play video/computer games, read books, and play sports].
- **Q2 on the weekend do you spend most of your time** [7 possible multiple responses: TV, talk with friends, play outside, play video/computer games, read books, play sports].
- **Q4.How often do you watch TV** Every day, almost everyday, hardly ever, never
- **Q8.How often in a week do you do a physical activity with your family**
- Every day, almost everyday, hardly ever, never

The highest response for after school activities was screen time.
The majority of children stated they watch TV everyday or almost everyday.
By grouping the responses into 2 subsets with every/almost as one subset and hardly/never another, Physical activity with their families was reported to be higher than not i.e. the children answered they do physical activity with their family everyday or

almost every day. A note of caution is that "physical activity" was not defined in the questionnaire.

Other items not used in this analysis from the survey were:
Q3.During free time list 3 things you like to do best?
Q5.How many hours of TV do you watch everyday?
Q7.If there are other activities you do once a week or more please list.

READING PRACTICES

- **Q6.How often do you Read a book in your free time**
- Every day, almost everyday, hardly ever, never

The majority stated they read everyday.

SLEEP HABITS

- **Q10 what time do you go to bed on a school night?**
- **Q11 what time do you get out of bed in the morning for school?**

Average reported sleep was 9.43 hours per school night. However, the number of hours of sleep per night did range from a low of 7 to 11.5 hours with 15 children reporting bedtime 8 or 9 o'clock. 4 went to bed at 11 and 1 10:00.

Other items not used were:
Q12. What time do you go to bed on a weekend?
Q13. What time do you get up on the weekend?

NUTRITIONAL PRACTICES

Questions used in this analysis were:
- **Q14 Do you eat breakfast before school?**
- Yes or No
- **Q17 How often do you eat junk food like pop chips and candy.** Every day, almost everyday, hardly ever, never
- **Q18 How often do you eat out at fast food restaurants like McDonald's, KFC?**
- Every day, almost everyday, hardly ever, never
- **Q19 How often do you have pop**
- Every day, almost everyday, hardly ever, never

The majority of children reported they ate breakfast prior to going to school.
Most children reported hardly ever or never eating junk food everyday.
The majority of children stated they hardly ever ate out at places like McDonald's or

KFC.
Most children stated they had pop everyday or almost everyday. Interestingly when asked previously if they had junk food [pop included in the definition] everyday or almost everyday the majority stated they did not.

Other items from the questionnaire not used in analysis were:
Q16. What do you eat for snacks?
Q15. What do you eat for breakfast?

SPRING 2005

GRADES 3-5

The number of students participating was 24[n=24]. The same items were used for analysis.

AFTERSCHOOL/LEISURE TIME

The highest response for after school activities was screen time in the fall whereas in the spring the highest responses were play outside! Combining screen time [TV and video/computer] the children still stated to play sports, read, talk with friends and play outside more than screen time.

The majority of children stated they watch TV everyday or almost everyday in the fall however slightly >than 50% hardly ever or never watch TV everyday in the spring.

Physical activity with their families was almost even with responses when grouped every/almost and hardly/never.

READING PRACTICES

The majority stated they read everyday, as they did in the fall.

SLEEP HABITS

Bedtime ranged from 7-1130 pm
Average 9.473 hrs
Range from 7.5-12 hours
15 children reported they go to bed between 8-10 pm with the range from 7-1130.

NUTRITIONAL PRACTICES

Once again the majority reported they ate breakfast prior to going to school.
Most children reported eating junk food everyday or almost everyday. This was a higher number of responses for this answer than in the fall.
The definition of junk food was "pop, chips and candy", which left it open to individual interpretation.
The majority of children stated they hardly ever eat out at places like McDonald's or KFC.

Most children stated they did not have pop everyday or almost everyday, however it was only slightly >50%. The number of children stating they did not have pop everyday or almost everyday is less than in the fall data.

PHYSIOLOGICAL RESULTS

A large percentage of the students did not participate in the second blood sampling i.e.2 hours post meal .As this total group represented a wide range of ages from 5-10 years of age the following tables are organized with the total sample results followed by the two different group results that are displayed separately, K-2 [age range 5-7 years] and Grades 3-5[range of age 8-10 inclusive].
Confidence was set at 95% for all statistics. For the spring screening the 2003 Canadian Diabetes Association [CDA] Guidelines were used [Appendix A] and therefore fasting blood glucose was the measurement of choice as opposed to the fall where both fasting and post meal samples were used. In the spring only those children with elevated blood glucose levels were re-tested. Reference values used for blood glucose screening were as follows:
Normal=Fasting blood glucose levels </ 5.7 mmol/l .If elevated, a two hour post meal sample was taken and reference values were normal=<7.8mmol/l. Please refer to Appendix A for reference values.

FALL RESULTS OCTOBER 2004

TABLE 1
TOTAL SAMPLE [K-5] HEIGHT, WEIGHT AND BLOOD GLUCOSE LEVELS
Confidence at 95%

	Mean	SD	STD ERROR OF MEAN	Confidence intervals [CI] +/-	N [sample]
Height [cm]	118.51	9.01	1.374	2.69	43
Weight [kg]	23.59	6.48	0.989	1.938	43
Blood [fasting][mmol/l]	5.164	0.664	0.102	0.199	42
Blood [2hour post meal] mmol/l	6.263	0.943	0.201	0.393	22

RESULTS

For the total sample of children in this cohort that participated in blood glucose screening the mean fasting blood level was within the normal range, </ 5.7 mmol/l, at 5.164mmol/l. Two hours post meal values for the total group were also in the normal range at 6.2 mmol/l. Out of the 42 students participating in blood screening, only 22 provided samples for the post meal values i.e. approximately 50% less than the fasting sample size.
The mean height of the total sample for children in grades kindergarten to grade 5 inclusive was 118.51 cm +/- 2.69 given 95% certain that these values capture the true mean. Mean weight [kg] was 23.59 kg [SD=6.48] +/- 1.938 confidence that the mean lies between these values. As for blood glucose values with the confidence at 95% were: fasting=5.164mmol/l+/- 0.199; and 2 hour post meal=6.263mmol/l+/- 0.393.

FALL 2004

TABLE 2: GRADES K-2 HEIGHT, WEIGHT AND BLOOD GLUCOSE LEVELS 95%CONFIDENCE

	Mean	SD	STD ERROR OF MEAN	Confidence intervals [CI]	N [sample]
Height [cm]	116.272	8.377	1.786	3.500	22
Weight [kg]	21.954	5.439	1.159	2.271	22
Blood [fasting] mmol/l	5.22	0.448	0.097	0.190	21
Blood [2 hour post meal] mmol/l	6.133	0.937	0.220	0.431	18

Most of the participants in grades kindergarten to grade 2 participated in both fasting and 2 hour post meal blood glucose screening. The fasting blood glucose and 2-hour post meal values were within the normal range at 5.22 [SD=0.448] and 6.13[SD=0.937] respectively. The confidence intervals for fasting blood values was 5.22 mmol/l +/- 0.190 and for 2-hour post meal was 6.133-mmol/l +/- 0.431. Height and weight mean values were as follows: mean height was116.272 cm +/- 3.500 given 95% certain that these values capture the true mean. Mean weight [kg] was 21.954 kg [SD=6.48] +/- 2.271confidence that the mean lies between these values.

SPRING 2005

TABLE 3: GRADES K-2 HEIGHT, WEIGHT AND BLOOD GLUCOSE 95%CONFIDENCE

	Mean	SD	STD ERROR OF MEAN	Confidence intervals [CI]	N [sample]
Height [cm]	120.857	9.248	2.018	3.955	21
Weight [kg]	25.314	7.161	1.562	3.061	21
Blood [fasting] [mmol/l]	5.091	0.834	0.182	0.356	21
Blood [2 hour post eating] [mmol/l]	6.85	0.834	0.417	0.817	4

The mean fasting blood levels for grades kindergarten to grade 2 for the spring screening were also within the normal range </ 5.7 mmol/l at 5.091[SD=0.834] .The 2 hours post meal values were also in the normal range at 6.85 mmol/l [SD=0.834]. Mean blood glucose values were: fasting = 5.091 mmol/l+/- 0.356; and 2 hour post meal = 6.85mmol/l+/- 0.817.

From this sample the mean height for kindergarten to grade 2 children was calculated to be 120.857cm +/- 3.955 certain that these values capture the true mean. The mean weight [kg] was 25.314kg [SD=7.161] +/- 3.061 with 95%confidence that the mean lies between these values.
Four participants required post meal screening as their fasting glucose level had been > 5.7 mmol/l. Of the four, one child was referred on for further screening at a physician with a venous blood sample. The final result was a normal blood glucose levels for that child.

SPRING 2005

TABLE 4: TOTAL [K-5] HEIGHT, WEIGHT AND BLOOD GLUCOSE 95%CONFIDENCE

	Mean	SD	STD ERROR OF MEAN	Confidence intervals [CI]	N [sample]
Height [cm]	139.470	8.732	1.222	2.395	51
Weight [kg]	41.931	16.480	2.307	4.521	51
Fasting Blood [mmol/l]	5.555	0.893	0.133	0.260	45
2 hour post meal Blood [mmol/l]	5.94	0.543	0.108	0.211	25

For the total group of children from grades kindergarten to grade 5[n=45] the mean fasting blood level was in the normal range. Blood glucose values, with the confidence at 95%, showed the mean fasting value was 5.555mmol/l+/- 0.260; and 2-hour post meal [n=25] was 5.94mmol/l+/- 0.211.

Screening of 2 hour post meal was done on any child that had an elevated fasting blood glucose level>/5.7mmol/l .A total of 25 children [n=25] i.e. greater than 50% had higher than normal fasting blood glucose.

Height was 139.470cm +/- 2.395 given 95% certain that these values captured the true mean of the sample [n=51]. The mean weight [kg] was 41.931kg [SD=16.48] +/- 4.521 at 95% confidence that the true mean lies between these values.

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TABLE 5: GRADES 3-5 HEIGHT, WEIGHT AND BLOOD GLUCOSE 95%CONFIDENCE

	Mean	SD	STD ERROR OF MEAN	Confidence intervals [CI]	N [sample]
Height [cm]	135.791	7.706	1.573	3.083	24
Weight [kg]	37.895	12.759	2.604	5.103	24
Blood [fasting][mmol/l]	5.623	0.766	0.167	0.327	21
Blood [2 hour post meal]	6.055	0.524	0.117	0.229	20

As for blood glucose values, with the confidence at 95%, the mean fasting values for this sample of children in grades 3-5 [n=24] was 5.623 mmol/l+/- 0.327; and 2 hour post meal [n=20] was 6.055 mmol/l+/- 0.229.All values were within normal limits. Most of the sample [21/24] participated in blood glucose screening and only one did not provide a sample for 2 hour post meal screening.

Mean height was 135.791 cm [SD=7.706] +/- 3.083 given 95% certain that these values capture the true mean. Mean weight [kg] was 37.895 kg [SD=12.759] +/- 5.103 confidence that the mean lies between these values.

SPRING 2005

TABLE 6: GRADES 3-5 HEIGHT, WEIGHT AND BLOOD GLUCOSE CONFIDENCE AT 95%

	Mean	SD	STD ERROR OF MEAN	Confidence intervals [CI]	N [sample]
Height [cm]	142.740	8.396	1.615	3.165	27
Weight [kg]	45.518	18.705	3.599	7.05	27
Blood [fasting][mmol/l]	5.495	1.004	0.205	0.401	24
Blood [2 hour post meal][mmol/l]	5.48	0.370	0.165	0.323	5

As for blood glucose values for children in grades 3-5 in the spring [n=24], with the confidence at 95%, the mean fasting was 5.495 mmol/l+/-3.165; and the mean of the 2-hour post meal was 5.48-mmol/l +/- 0.323[n=5]. The majority of students participated in the screening of blood glucose. 5 of the total sample [21%] had to be retested, with a 2 hour post meal sample as a result of elevated fasting glucose Out of these 5, 2 were sent for further evaluation as a result of elevated 2 hour post meal blood glucose levels. Further evaluation with venous blood samples ordered by their family physician showed their levels to be within the normal range.

The mean height [n=27] was 142.740 cm [SD=8.396] +/- 3.165 given 95% certain that these values captured the true mean. Mean weight [kg] [n=27] was 45.518 kg [SD=18.705] +/- 7.05 with 95% confidence that the true mean lies between these values.

DISCUSSION

GRADES 1 AND 2

AFTER SCHOOL ACTIVITIES

It is worthwhile to note that perhaps having visuals to assist the children in their response recall actually lent itself to bias, as the visuals could have been misleading. Also, the literature suggests that the age group best able to respond independently and with validity to questionnaires is 10 years of age and up.

"After school activities" For grades 1 and 2 did not change from fall to spring in that screen time was still the most popular choice. Of important note is that "daily TV" viewing decreased in the spring. This change in reports could be the result of increased daylight and improved weather. From a Canadian report of children's physical activity of ages 12 plus approximately 36% children had 2 hours of screen time per day [Shields, 2005]."Weekend activities" did also change over this time period from fall to spring i.e. most reported they "played". "Other activities" the children reported they liked to do when not in school remained the same for both fall and spring i.e. "arts/crafts ".

READING PRACTICES

With respect to literacy development and reading at home, either alone or with someone, it was difficult to evaluate this variable as children in this group were probably not independent readers therefore their reporting may not be accurate or have been misinterpreted .For example they reported to not "read at home" however stated someone did read with them.

Another finding was that more children reported to read at home in the spring than in the fall. This could actually be the case as there was an initiation of a school-community literacy project and testing for literacy levels during the same period. Also, the children could have better understood the question after answering it previously. Even if the children reported to not read at home and did not understand the question the majority did report to "read with someone". This is encouraging as literacy is an important determinant of health that is integral to educational attainment, development of self confidence and making positive lifestyle choices, increased socio-economic and health outcomes. Perhaps the interpretation of Q 7 [do you read at home?] elicited an unexpected response as the majority stated they did read but with someone. This age group would possibly not yet be reading independently and so this would explain the conflict in the responses. Another plausible explanation is if the children are not yet reading independently therefore probably would not choose this activity to do on their

own. From the literature a study by Kuo, Franke, Reglado and Halfon, 2004, the study found that for 35-month old children to ages 3 years only 52% were read to at home. The results from study, if taken the results as valid, demonstrated, suggest that more children in this cohort are aware of or are being read to more often than the children in the Kuo et al, 2004 cohort of children. This is very encouraging!

SLEEP HABITS

Sleep habit responses were not verified by parents/adults in the home. Children ages 6, 7 are probably still learning to "tell time" so they may not actually have provided accurate information on "bedtime". However, their responses do fall in line with the literature suggestion of amount of sleep required for children this age that children between ages 5-10 require 9-10.5 hours [Iglowstein et al, 2003]. Children in this subgroup, grades 1 and 2, stated to go to bed between 8-12 pm suggesting a range of hours of sleep of 8-12 hours. The results suggest that the majority of children are getting the average number of hours of sleep per night however the children's reports have not been verified.

NUTRITIONAL PRACTICES

Information had been given to the students over 2-3 year period prior to this study on the importance of eating breakfast before school. This could have possibly influenced their reports of eating breakfast causing a bias. However, perhaps the educational sessions on nutrition and the importance of eating breakfast did have an effect as all of the children reported to eat breakfast before school!! Whatever the reason eliciting this response eating breakfast is an integral part of a healthy start to a child" day and the children's responses reflect such health behaviour. The literature review actually does not reflect the same in other cohorts where the results demonstrate that children are generally not eating breakfast [Taylor et al, 2005].

GRADES 3-5

AFTER SCHOOL ACTIVITIES

As this was a multiple response question it is difficult to determine whether or not these responses are significant i.e. some children may also have reported to do other activities as well such as play, sports and talk with friends. The questionnaire did not provide the children with the ability to rank each activity based on frequency. This would be consistent with the results from Shields, 2004,which stated that over 1/3 of children aged

6-11 had 2 hours or more of screen time per day during leisure and activity time.
The suggestion by Pescatello, 2001 that active lifestyle is the best method of activity to maintain and sustain for physical fitness

However, the activity most chosen in the spring was not screen time as it was in the fall. In the spring responses, "reading" as an activity did fall drastically but so did screen time! Most of the children stated they talked with friends, played outside and played sports on the weekends in the spring.

A possible explanation for the spring increase in responses to play outside and sports, as opposed to screen time could be due to the weather [spring/summer], more daylight hours especially after school was finished, and exposure to a healthy lifestyle program at school for 8 months post the initial survey in the fall.

A note of caution is that physical activity was not defined in the questionnaire. For example, some children reported their activities to be "four wheeling" so they actually could have chosen" play outside" or 'with friends" but could have been doing so while four wheeling or riding their motorized scooter.
Another example of a response was "talked with their friends" but it was not clear whether this was on the telephone, computer ["talk on MSN"} or actually during outside, active play.
Either way, social interactions of some sort, through variety of communication networks, could possibly be considered positive for healthy child development and development of personal practices. Social networks and environments are non-medical determinants of health and are very integral to health status.
Activity as a family was measured by grouping the responses into 2 categories: 1.everyday/almost everyday and 2.hardly ever/never. By using this categorization the results showed that "physical activity with family" was reported to be higher than not i.e. the children answered that they participate in family activity more often than not. It is important to note that "family activity" was not defined so it did not measure only physical activity; it could represent time together doing other things like going to the movies, walking, playing board games etc. However, interaction with and the structure of the family unit is an important component necessary to healthy development of children with respect to emotional, mental social health, so the cohort could view this as a positive lifestyle response.

READING PRACTICES

When comparing the fall results with the spring results the responses did not demonstrate a change in the number of children stating they read at home. This is significant in itself as whether or not the children do actually read at home everyday, during school home work or leisure time, they still are reading daily or at the very least aware of the importance of this behaviour.

SLEEP HABITS

The actual average number of hours reported to have slept on a school night was unchanged from the fall to the spring [9.43 hours to 9.473 hours respectively]. The range of number of hours did go from a low of 7 to 12 hours. Therefore this age group are somewhere in the norm as suggested by the literature [Iglowstein et al, 2003]. The few children receiving only the minimal of 7 hours for this age group are lacking in appropriate quantity. In the literature, low levels of sleep are consistent with possible poor attention and academic attainment thus not fostering healthy behaviours [Roberts, Roberts and Chen, 2001] However, the results from this cohort suggest that most of the children in grades 3-5 are getting enough sleep.

NUTRITIONAL PRACTICES

The majority of children in this subset reported to eat breakfast everyday before school for both the fall and spring surveys! Eating breakfast has been defined as a scheduled meal that not only assists with daily functioning but also is suggestive of structure in the family [James, 2005].

Responses for frequency of eating junk food showed that children hardly ever or never ate junk food in the fall but in the spring they stated they did eat junk food everyday or almost everyday!! Remember that the definition of junk food was limited to "like pop, chips and candy" and could have possibly influenced their responses.
In both fall and spring the majority of children stated they hardly ever ate out at places like "McDonald's" or "KFC". The questionnaire could have been misleading, as these were the only two fast food restaurant s mentioned in the question so other choices may not have been thought of as possible responses. Another bias for the responses could have been that the definition of "eat out" was misleading as "take out" could have been eaten at home from these places or other fast food restaurants.

Most children reported they had pop every day or almost everyday in the fall as opposed to>50 %stated in the spring they did not drink pop every day or almost everyday. Interestingly when asked previous question if they had junk food [pop included] everyday or almost everyday the majority stated they did not. The results are conflicting. Anecdotally, however, after health education and policies placed in the school during this project, the recreation manager for after school community activities reported that when going to the movies the children were choosing water in place of pop!! The school principal also reported to have parents follow through on the 'no pop in school" suggestion and therefore children were not bringing pop to school!

PHYSIOLOGICAL MEASURES: HEIGHT, WEIGHT AND BLOOD GLUCOSE

For the spring 2005 results and combining both subgroups [K-5] blood glucose values, it was found that 5 of the children required testing post meal due to elevated fasting blood glucose levels. Out of these 5 children, 2 required a further referral for evaluation with venous blood. This initially suggested a 4% prevalence of impaired or elevated glucose levels. However, on further evaluation with family doctors and venous blood samples; both children had normal fasting levels. In the spring a total of 25 children had elevated fasting blood glucose levels. It is unclear why this happened but could possibly have been a result of the children forgetting to fast although the children were asked prior to testing if they had eaten before or not. Possibly, there could have been an error with the glucometers or strips used. However, once the children were tested at 2 hours post breakfast they all were in the normal range.

The difference in the fall and spring values for both height and weight cannot be commented on for interpretation. It is expected that children would grow both in height and weight in the given time frame of 8 months interval. The values were provided by the researcher to parents if they were outside of normal range i.e. if a child's height and weight were out of the normal range [greater that 85% or lower than 10% on the Center for Disease Control charts for children in the age groups of the cohort] .A follow up was then suggested for further evaluation for height and weight. The children's heights and weights were used for calculating Body mass indices for the parents and children only as a baseline for their health status. The BMI's were not used in this study as there is considerable controversy in using BMI only for evaluating healthy status in children .BMI is useful perhaps with other measures such as body fat distribution. Caution should be noted when using BMI across gender and race and for reporting on a cohort as a single entity of the health status [Daniels, 1996].

It must be remembered that the intent of the screening was also to assess health status in relation to chronic disease development in the future however the screening also provided an increase in the awareness of health measures to children, parents, the school and the community. These clinics also opened the doors to an educational opportunity.

The primary purpose of this study was to evaluate health risk factors of this cohort of children with respect to their future development of chronic disease. However, basing the health status of a cohort on a single parametric, such as BMI values, blood glucose, as opposed to health behaviour reports did not provide the necessary information to make any assumptions. Blood glucose screening was used mainly because the children were used to this practice from previous clinics as well as ongoing community education on Type 2 Diabetes.

In summary the results from both subgroups of this cohort suggest that children are aware of the importance of reading at home or reading with someone, get an average amount of sleep, eat breakfast everyday and are interactive with friends or family frequently, and do

not have elevated blood glucose levels.

RECOMMENDATIONS

The following are suggested implications of this study and suggestions for future research.

QUESTIONAIRE

For future research, pilot testing of the questionnaire is recommended. This would ensure that the questionnaire is age and developmentally appropriate and that it is reliable. Also, study design of this research should include validity testing of the children's reports from the questionnaire, under the age of 10, with adults such as caregivers, parents, schoolteachers and other after school centers. Simultaneously, it would be suggested that the parents' perceptions of their family practices would be helpful in determining the health behaviours practiced in the context of the whole family and not only that of the child.

STUDY DESIGN

Screening of children with anthropometric methods in the future is not recommended. In this study the actual number of children participating in fasting and post meal blood testing did not warrant the children having their finger lanced. However, for specific children at risk perhaps screening is warranted. Also, as the controversy surrounding body mass index use for children is ongoing, the measurement of height and weight did not produce any findings that make this a worthwhile practice for the future. The blood glucose values for the sample were also normal.

Instead, future research in the area of children's health should have a family/community-based approach since they are the contexts that influence the child daily on a daily basis. Such research could be the measurement of a community's health; specifically, the recommendation is to study the influences on the actual development of the health behaviours. With this approach researchers could provide invaluable information in health planning for populations, thus affecting the outcome of children's health.

Since the social determinants of health are of utmost importance in targeting the health outcome of individuals, families and communities, it is imperative that research is further used to ascertain exactly what is determining health practices and not what the practices are! Social capital community developments with a focus on the formation of healthy behaviours early in life, emphasising the development of trust, engagement in the community and participation and volunteering opportunities is essential if increasing

health outcome is the overall objective. Putting these concepts into practice by developing a social capital community framework would provide an environment conducive to developing a positive health outcome. This would assist in the development of children's confidence and social support networks.
A final suggestion from this study is to focus on family and social involvement in the community. The research approach should be to develop a best practice framework for healthy behaviour development within a community-family context that provides optimum health outcomes.

CONCLUSION

In conclusion this study found that the measurement of children's health status through anthropometric means is not practical or purposeful as children's health status is based primarily on early exposure to environments that are conducive to the development of healthy behaviours. Exposure early in a child's life in influential contexts such as family and community is paramount to decreasing risk factors to future development to chronic diseases.

Research should be aimed at lifestyle behaviours of the children and not weight, height, body mass indices or serum levels of glucose, since, for example, children who are below the 10% percentile could also be exposed to unhealthy practices. Perhaps for measurement of individual longitudinal profiles, it may be helpful to monitor the individual's health within a cohort by providing screening or pre diagnostic evaluation. However, from the outcome of this research it is not recommended that an individualized approach to measuring health be the method of choice. Instead, utilizing a community approach to the development of social capital within the context of the family and community would be advisable in altering health outcome. Health status or outcome is related to the social determinants of health.

Measurement of the social determinants of health affecting the children's health was beyond the scope of this research. Also, the study was not able to measure the risk factors prevalent in the cohort for future development of chronic disease; however, it was able to state that for health behaviours to have meaning the actual frequency or count of those behaviours is not useful information in developing children's healthy environment. Measuring what is actually affecting the development of those health behaviours in a community context would provide more meaningful research.

Integrating the concepts of social capital could be a plausible suggestion for research into the development of healthy behaviours by children as research shows that social capital increases for individuals who are well integrated into their community and have a sense of self efficacy [Morrow, 1999]. Therefore the development of a community based framework for increasing the health behaviours of the members would likely increase the outcome.

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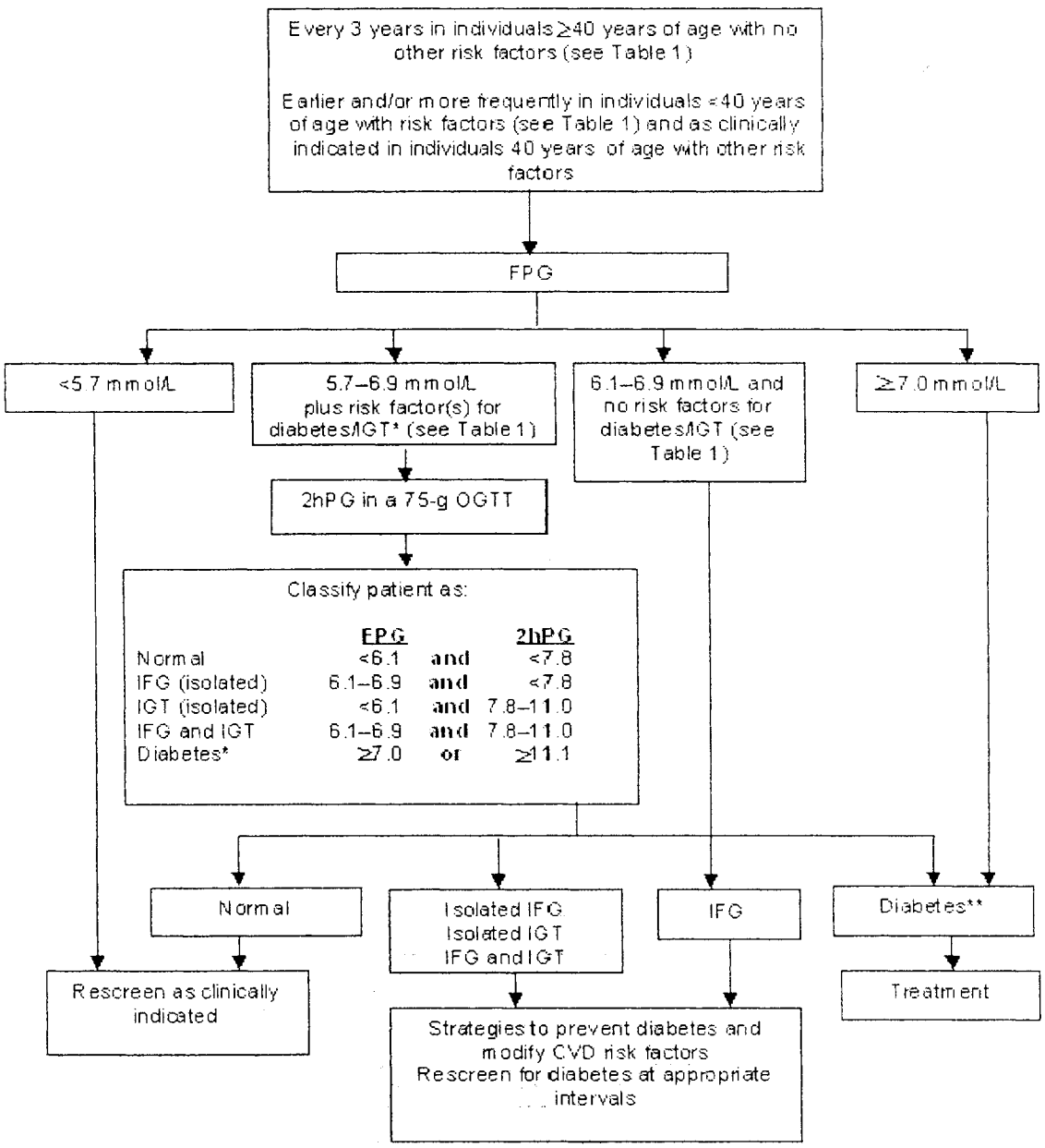
APPENDIX A



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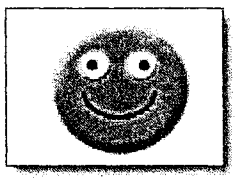
APPENDIX B

HEALTHY HAPPY ME!



HEALTH PROFILE GRADES 3-5

Name: _____

Grade: ___

ACTIVITY

1. After school, most of the times do you:

Watch Television Talk with my friends play outside
Play video/computer games Read books Play sports
Doing other things (Write below) _____

2. On weekends, do you spend most of your time:

Watch Television Talk with my friends play outside
Play video/computer games Read books Play sports
Doing other things (Write below) _____

3. During your free time, what are the three (3) things you like to do the most?

a. _____

b. _____

c. _____

4. How often do you watch television?

a. Every day b. Almost every day c. Hardly Ever d. Never

5. How many hours per day do you usually watch television?

0-1 1-2 2-3 3-4 4 or more

6. How often do you read a book in your free time?

a. Every day b. Almost every day c. Hardly Ever d. Never

7. If there are other activities that you do once a week or more, please list them below:

a. _____

b. _____

c. _____

8. How often in a week do you do a Physical activity with other members of your family? (Hiking, walks, sports)

a. Every day b. Almost every day c. Hardly Ever d. Never

9. How do you usually get to school?

Walk Ride a bike Take the bus Get a ride

SLEEP

10. What time do you go to bed on a school night? _____

11. At what time do you get out of bed in morning for school? _____

12. What time do you go to bed on the weekend? _____

13. What time do you get out of bed on the weekend? _____

NUTRITION

13. Do you eat breakfast before school?

Yes _____ No _____

14. What do you usually eat for breakfast?

_____

15. What do you usually eat for snacks? (List 3)

a. /_____

B/. _____

C/. _____

16. How often do you eat junk food?

a. Every day b. Almost every day c. Hardly Ever d. Never

17. How often do you eat out?

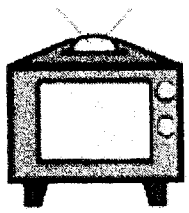
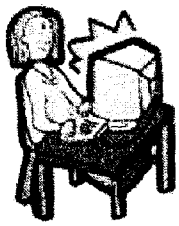
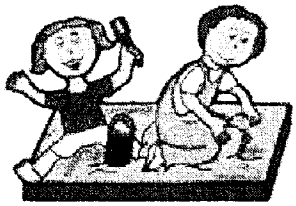
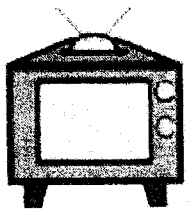
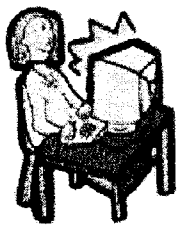
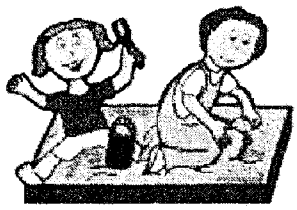
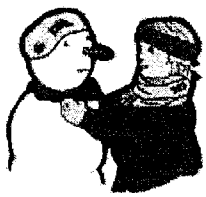
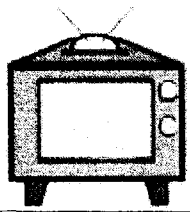
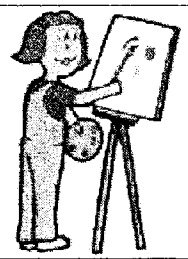
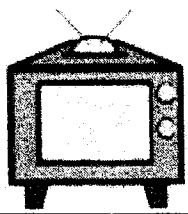
a. Every day b. Almost every day c. Hardly Ever d. Never

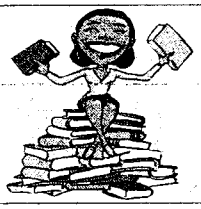
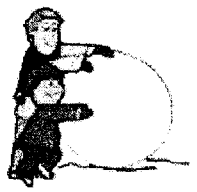
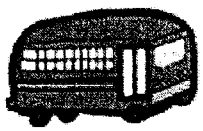
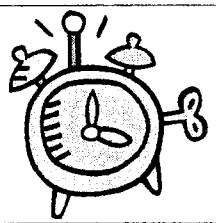
THANK YOU FOR ANSWERING THESE HEALTH QUESTIONS!
HAVE A NICE DAY!

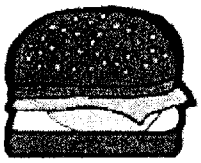
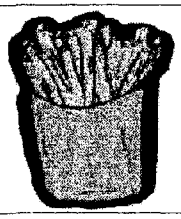
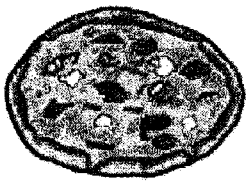
APPENDIX C

HEALTHY HAPPY ME! -- *HEALTH PROFILE GRADES K-2*

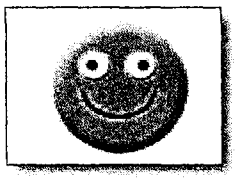
Name: _____ **Grade:** _____

What do you do after school?			
What do you do on the weekend?			
When you are not at school, what do you like to do?			
Do you watch TV everyday?		yes ❑	no ❑
How many TV shows do you watch everyday?	more than 5 ❑	3 to 5 ❑	less than 3 ❑
Which TV shows do you watch? (list)	_____	_____	_____

Do you read books at home?		yes ❑	no ❑
Do you read with someone?		yes ❑	no ❑
What do you like to do with your family?			
How do you get to school?			
When is bedtime?		_____	_____
Do you eat breakfast before school?		yes ❑	no ❑
What do you usually eat for breakfast?	_____	_____	_____
What do you like to eat for snacks?	_____	_____	_____
How often do you eat snack like Chips, chocolate bars and candy?	_____ chips	_____ pop	_____ candy
Most days what do you eat for supper?	_____	_____	_____

How often do you eat foods like?	McDonalds	KFC	Pizza Delight
			

THANK YOU FOR ANSWERING THESE HEALTH QUESTIONS!
HAVE A NICE DAY!



APPENDIX D

SHELLEY LANDSBURG BN RN
COMMUNITY HEALTH NURSE

ST. MARY'S HEALTH CENTER

440 HIGHLAND AVE.
FREDERICTON, N.B.
E3A 5V9
PHONE: 506- 452-2760 FAX: 506-459-2998
E-MAIL: n6slands@nb.aibn.com

September 15, 2004

Chief Candice Paul & Council
St. Mary's First Nation

Dear Chief Paul:

Greetings from the School Community Health Team! I hope that you enjoyed the summer. I am sure that you are all busy gearing up for a busy and productive year at St. Mary's First Nation. The Aboriginal Diabetes Initiative teams, in conjunction with the Community Health staff and school staff, have been forging ahead with the "healthy lifestyle" approach to education at the school, and the results so far have been overwhelmingly positive. I am sure you have heard about the highly successful results we had last year at the school with the daily walking program and the diabetes screening. We are so proud of the effort put forth, especially by the students and staff of the school. They are working very hard to make their educational environment a healthy one!

It is quite likely that we have students in the school who either have diabetes and do not know it, or are at high risk of developing the disease due to a slightly higher than normal blood sugar level. As we did last year, we want to provide the students an opportunity to have their blood sugar tested again. This year we also would like to offer a cholesterol-screening test. In order to demonstrate that the physical education program that is to start at the school in collaboration with UNB, ADI, school and the community health nurse, we would like to offer the testing twice this school year, September, and May. Participation in this project will be voluntary and all data will be confidential. Parents will be informed, and if interested, will be asked to provide written consent for their child

to take part. After testing, a letter will go home with the students to their parents. Any children determined to be at risk following he screening will have the CHN contact their parents for follow-up. This screening would entail a capillary blood sample from the student (obtained by finger stick) and analysis done by a qualified health professional. We would like to emphasize that this is a **completely voluntary service** for those parents who wish to have their child screened in order to obtain relevant and timely information about their child's blood sugar levels.

I and the staff of CHSMES have developed the plan for the screening in conjunction with the school principal, Walter Paul; our aboriginal diabetes consultant, Shelley Leighton; and UNB Faculty of Kinesiology professor, Dr. Gabriela Tymowski. The proposed dates for this project are sometime in late September or early October and in May 2005. In addition, we have recruited Margie Gray, ADI Dietician, to assist in the screening process. The additional health staffs are required to ensure that the screening process is carried out in an organized and timely manner so as not to disrupt the regular school schedule.

We look forward to your support this endeavor, which will benefit the students of CHSMES by determining their risk of developing diabetes, as well as the community in promoting optimal child health. It will also help us to identify the areas we need to work on in order to better address the issue of illness prevention and health promotion in the school. I encourage you to call either Shelley Leighton or me with any questions or concerns you might have regarding this endeavor. We look forward to assisting the school and the entire community in addressing the diabetes epidemic and hope to hear about other ways in which we can help.

For a Diabetes-free nation,

Shelley Landsburg, BN RN CHN
St. Mary's First Nation

Lorraine Bear, CHR
St. Mary's First Nation

Shelley Leighton, BN RN
Diabetes Community Consultant
Union of NB Indians

APPENDIX E

Consent Form

Health screening clinic: CHSMES

June 1, 2005

Dear parent or guardian,

Following the information presented in the letter of information to parents or guardians, if you wish your child to take part in the Health Screening Clinic at the Chief Harold Sappier Elementary School, please read and sign the following:

- I understand that my child will have his/her blood sample taken by a Registered Nurse using a sterile lancet, from his/her finger. This will be done upon arrival at school after having fasted over the previous night.
- I understand that a second blood sample will be obtained 2 hours after my child eats breakfast, which we will provide. This breakfast will be consisting of 80 grams of carbohydrates that will be measured by a dietician. The foods will include choices like yogurt tubes, milk, fruit, cereal, toast, muffins, etc
- I understand the purpose of this screening is to test both blood sugar and cholesterol; this information will be used to assess my child's current status and risk of developing diabetes, heart disease and other illnesses.
- I understand that my child will also have his/her height and weight measured and recorded and may be asked to complete a pencil and paper health questionnaire.
- I understand that my child's participation in this study is entirely **voluntary** and that I may withdraw my child from this study at anytime, for any reason.
- I understand that not participating or withdrawing from this study will not change the way my child is treated at school.
- I understand that all of the results will be kept strictly **confidential,** and all data will be secured with the Community Health Nurse in the same confidential and secure manner that all medical records are maintained in the Health Center and that only UNB faculty member, Dr. Gabriela Tymowski, graduate students and research assistants will have access to these data.
- I understand that the results will be coded so there is **no way to identify my child** directly within the study report. Once entered into the database there will be no way to identify my child in the larger set of data reported.
- I understand that this data may be used in the future to answer questions relating to the health status of the children in this community, and to consider the effects of the school's healthy lifestyle program on the children's health. This will help with future planning for the students, school and community. This data will be used to publish the reports of this project.

- I understand that all data will be kept strictly confidential and secure I have been given the opportunity to contact the Community Health Nurse, Shelley Landsburg at the Community Health Center, and have had any questions answered to my satisfaction
- I understand that if my child does not wish to participate in this project, that he or she will not be asked to do so

- I understand that the Community Health Nurse will contact me to review my child's results if those tests indicate areas of concern.

I hereby give my consent for my child to participate in the Screening Clinic to be held at CHSMES on January 23 and June 24, 2004. I understand that a sterile lancing device will be used on the fingertip to take a capillary blood sample and the results will be shared with me/us within a week of the screening clinic.

If I have any questions now or at any time, I may contact Shelley Landsburg, Community Health Nurse at the St. Mary's Community Health Center at 452-2756, ext. 116, Walter Paul, the principal of CHSMES at 462-9683, or Julia Kennedy – Francis the Health Director of the St. Mary's Community Health Center at 452-2750.

_____

Signature of parent/guardian

_____

Signature of student

Date

Please see next page

PLEASE COMPLETE THE FOLLOWING: (please print)

Name of Student: _____

Father: _____ **Mother:** _____

Address: _____

Postal Code: _____

Phone: (H) _____ **(W)** _____

Birth date: _____ **Family Doctor:** _____

Allergies:

Food: _____ **Medications:** _____

Other: _____

APPENDIX F

CHIEF HAROLD SAPPIER MEMORIAL ELEMENTARY SCHOOL

Health Screening Clinic

Parent information letter

June 1, 2005

Dear parents or guardians, and students:

Your Community Health Team has been addressing the issue of healthy lifestyles in the CHSMES for the past two years. Many educational sessions have been delivered to the students and staff of the school in order to heighten the awareness of the Diabetes epidemic among First Nations People in Canada. Several positive changes have been made in the school over the past year to promote a healthy environment for your children, including a physical education program, healthy lifestyle classes, and healthier nutritional choices for the students. As you may be aware, First Nations children are at a greater risk of developing Diabetes at a younger age than the average Canadian population, so our efforts in this regard are particularly important for your children.

Last October we tested your child for Diabetes by measuring their blood sugar, and we also measured their height and weight. We would like to test the children again now that the school year is almost completed. The Community Health Nurse and the Aboriginal Diabetic Nurse Consultant will do this testing of blood. Again, we would like to give your child the opportunity to be tested at school. This **is entirely voluntary**. Screening information about your child will be kept completely **confidential**. This testing will allow the Community Health Team to identify the health risks of Diabetes for the students tested, and assist with prevention efforts for the family, school and community. This testing will also provide an opportunity for us to evaluate the effect of daily physical activity on the health status of the children.

The Community Health Team has organized a **Screening Clinic to be held on June 7 and 8, 2005 at CHSMES**. Each student will have the opportunity to meet with nurses and a dietician who will test their blood glucose levels (by obtaining a finger stick sample of blood), both before and after eating breakfast provided here for your child. We will discuss healthy lifestyle practices with each student, and inform them of they can reduce the risk of developing diseases like Diabetes and heart disease .The benefits to the students are many, including increased awareness of healthy lifestyles, identification of both elevated and impaired glucose levels, as

well as assessment of lifestyle factors that may be modified to improve their health. We also may ask your child to complete a pencil and paper health questionnaire at a later date.

If you would like your child to participate in this Screening Clinic, please complete the consent form attached. It is important to note that this is a **completely voluntary service** offered by the Community Health Team, and that **it is not mandatory for your child to participate. If they do not wish to be tested, they will not be treated any differently.** Although it is not compulsory in order for your child to be tested, we would like to invite the parents or guardians to accompany your child as they attend the screening clinic. The two-day clinic will have the following schedule:

Day 1 –June 7, 2005 beginning at 8:30 am: Grades K, 1, 2 screening

Day 2 –June 8, 2005 beginning at 8:30 am: Grades 3, 4, 5 screening

Each student's results will be recorded and sent home in a letter to the parents or guardians within a week after the clinic. It is important to note that any student who has elevated or an impaired blood glucose result should be seen by the family physician for further evaluation. The Community Health Nurse will be following up with those students and families and will be happy to assist in making the appropriate referrals. Since we may repeat the tests again next year, we would also like to ask your permission to keep these results for future comparisons and evaluation. Confidentiality is assured, again as it is with your entire child's medical records.

Should you have any questions/comments about the Screening Clinic, please do not hesitate to contact Shelley Landsburg, Community Health Nurse at 452-2760, Shelley Leighton, ADI Community Consultant at 458-9444. We would be happy to answer your questions and provide you with any additional information. Should you wish to speak to someone not associated directly with this project, you may contact the Research Ethics Chair at the University of New Brunswick, Dr. Peter Kepros, at 453-5189, or the Director of the Health Clinic, Julia Kennedy-Francis, at 452-2750.

Sincerely,

Shelley Leighton, BN RN - Diabetes Community Consultant, UNBI

Shelley Landsburg, BN RN CHN –St. Mary's First Nation

Lorraine Bear, CHR-St. Mary's First Nation