

PREDICTORS OF OVERWEIGHT AND OBESITY IN A SAMPLE OF RURAL SASKATCHEWAN CHILDREN

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ABSTRACT

The aims of this cross-sectional study were to: (1) estimate the prevalence of overweight and obesity in a sample of 262 rural Saskatchewan children and (2) to identify predictors of overweight and obesity. The data were collected using a self-report questionnaire and measurement of height and weight. When BMI values were compared to international standards the estimated prevalence was 25.5% for overweight and 7.1% for obesity. The significant predictors of overweight and obesity were gender, Aboriginal descent, parent's/guardian's perception of neighbourhood safety, and parent's BMI. Nurses can use these results to develop health promotion programs aimed at reducing the prevalence of overweight and obesity among rural children and their families.

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In the United States (Ogden, Flegal, Carroll, & Johnson, 2002; Wang, 2001; Wang, Monteiro, & Popkin, 2002), Canada (He & Beynon, 2006; Janssen, Katzmarzyk, Boyce, King, & Pickett, 2004; Veugelers & Fitzgerald, 2005; Willms, Tremblay, & Katzmarzyk, 2003), Australia (Booth et al., 2001), and other countries (Wang et al., 2002) the high prevalence of overweight and obesity among school-aged children is a major public health concern because of the long-term physical (hypertension, hyperlipidemia, and type II diabetes) and psychological (depression and poor self-esteem) effects (Carriere, 2003; He & Beynon, 2006; Veugelers & Fitzgerald, 2005). For Canadian children aged 2 to 17 years, published estimates vary from 7.7% to 35.2% for the prevalence of overweight (Galloway, 2006; Haque, de la Rocha, Horbul, Desroches, & Orrell, 2006; He & Beynon, 2006; Janssen et al., 2004; Shields, 2005; Veugelers & Fitzgerald, 2005; Willms et al., 2003) and from 2.3% to 19.1% for the prevalence of obesity (Galloway,

2006; Haque et al., 2006; He & Beynon, 2006; Janssen et al., 2004; Shields, 2005; Veugelers & Fitzgerald, 2005; Willms et al., 2003), with a higher prevalence of overweight (27.7% to 38%) observed for Aboriginal children (Bernard, Lavallee, Gray-Donald, & Delisle, 1995; Hanley, Harris, Gittelsohn, Wolever, Saksvig, & Zinman, 2000; Katzmarzyk, 2008; Katzmarzyk & Malina, 1998).

In addition to dietary factors, the high prevalence of childhood overweight and obesity has been attributed to an increasingly sedentary lifestyle (Janssen et al., 2004; Tremblay & Willms, 2003) characterized by low levels of regular physical activity and high levels of sedentary leisure activities, such as computer and video game usage (Davy, Harrell, Stewart, & King, 2004; Janssen et al., 2004; Lutfiyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007; Tremblay & Willms, 2003). One factor related to decreased physical activity levels is unsafe neighbourhoods; children of working parents are often instructed to remain indoors due to safety concerns (Molnar, Gortmaker, Bull, & Buka, 2004).

Compared to urban children, rural children may have a higher risk of becoming overweight or obese because of limited access to recreational programs and facilities (Bilinski, Semchuk, & Chad, 2005; Plotnikoff, Bercovitz, & Loucaides, 2004), associated travel costs (Plotnikoff et al., 2004), and socioeconomic factors (Lutfiyya et al., 2007). Overweight and obesity of rural children was found to be related to a lower income and lower education level of the parents (Plotnikoff et al., 2004). The lower socioeconomic status of rural families may affect their ability to purchase recreational equipment and to access recreational programs. In a previous study, using a self-report questionnaire and accelerometers, Tremblay, Barnes, Copeland, and Esliger (2005) found no significant differences in self-reported physical activity or BMI between a sample of rural and urban Saskatchewan children and a sample of Old Order Mennonite children in Ontario, Canada. Little is known, however, about the prevalence or factors associated with overweight and obesity in rural Canadian children.

The aims of the present study were to: (1) estimate the prevalence of overweight and obesity in a sample of rural Saskatchewan school-aged children and (2) to identify predictors of overweight and obesity.

METHODS

This cross-sectional study was conducted in a rural school division in south-eastern Saskatchewan where the main industry is agriculture (cattle ranching, wheat, and other grain farming) and there are four First Nation reservations. The target population included all students in grades 4 ($n = 145$), 5 ($n = 186$), and 6 ($n = 194$) attending 13 of the 14 schools in the target school division. The study participants lived in the 13 towns (population size: 172 to 1,067 persons) (Statistics Canada, 2002) or surrounding areas. Ethical approval of the study was obtained from the University of Saskatchewan Behavioural Research Ethics Board (Beh 05-201). Assent was provided by the child and consent by a parent or guardian.

Prior to starting the study, a 10 to 15 minute information session was held for the students in Grades 4 to 6 at each participating school. Each potential participant received a research package (information letter, two copies of the consent form, questionnaire).

Data collection occurred in October 2005 and included completion of the self-report questionnaire by the child and a parent or guardian at home and anthropometric measurement of the child at the school. The questionnaire consisted of three sections. Section one gathered demographic data about the child [date of birth, gender, grade, residency (farm versus town), Aboriginal versus non-Aboriginal] and the child's parents or guardian (perceived neighbourhood safety, educational level, height, and weight). Section two gathered data on the average number

of hours per day the child was involved in sedentary leisure activities (e.g., television watching, video games, talking on the phone). In section three, the Physical Activity Questionnaire for Older Children (PAQ-C) (Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997) was used to quantify the child's physical activity level during the previous 7 days. The PAQ-C consists of nine items scored 1-5 with a final score calculated as the mean of the nine items. Based on previous studies, the PAQ-C has an acceptable level of test-retest reliability (boys: $r = .75$, girls: $r = .82$) for children aged 8 to 13 years and a moderate level of construct validity ($r = .46 - .53$) (Kowalski, Crocker, & Faulkner, 1997).

Each participant's weight (measured ± 0.5 pound with a digital scale) and height and sitting height (each measured ± 0.1 cm with a stadiometer) were measured twice by the researcher with the child wearing light weight clothing and no shoes. A third measurement was taken when the two height or sitting height measurements differed by > 0.4 cm or the two weight measurements differed by > 1.0 pound. When two measurements were recorded, the average value was used. When three measurements were recorded, the median value was used. Each participant's BMI was calculated using the measured height and weight [weight (kg)/height (m^2)] and compared to international standards using the participant's age ± 6 months (Cole, Bellizzi, Flegal, & Dietz, 2000). Age at peak height velocity (PHV), calculated using the variables gender, date of birth, date of measurement, height, sitting height, and weight, was used to identify the participant's maturational age (Mirwald, Baxter-Jones, Bailey, & Beunen, 2002; http://taurus.usask.ca/growthutility/phv_ui.cfm?type=1). Maturity age is calculated by subtracting age at PHV from chronological age at the time of measurement. At PHV maturity age equals 0. Prior to PHV maturity age is negative. Following PHV maturity age is positive (Thompson, Baxter-Jones, Mirwald, & Bailey, 2002).

The data were coded, entered into computer compatible format, and analyzed using SPSS 14.0. Differences between boys and girls were examined using the t-test for independent samples. Chi square (with continuity correction) and Fisher's exact tests were used to explore associations between gender and the other categorical variables. One-way ANOVA and Scheffé's post hoc analysis were used to examine group differences in the mean PAQ-C score. Logistic regression analysis was used to identify significant predictors (and first order interactions) of overweight and obesity. Statistical significance was indicated by an alpha of .05.

RESULTS

Of the 525 questionnaires distributed, 262 were returned completed along with a signed consent form (49.9%) and 251 (47.8%) participants had anthropometric measures. The 262 students included 111 boys and 151 girls. Ages ranged from 8 to 12 years (boys: $M = 10.7$ years, $SD = 0.91$ year; girls: $M = 10.6$ years, $SD = 0.87$ year). The mean age at PHV was 13.3 years ($SD = 0.52$) for boys and 11.8 years ($SD = 0.55$) for girls. Participants were in grades four (27.1%), five (37.4%), and six (35.5%). Forty-three (16.8%) were self-identified as Aboriginal and 16 (6.1%) lived on a First Nation reserve. The proportions of farm (47.5%) and town (46.4%) residents were similar.

No significant differences were observed between boys and girls for height (boys: $M = 144.0$ cm, $SD = 8.19$ cm; girls: $M = 144.0$ cm, $SD = 8.89$ cm), weight (boys: $M = 41.4$ kg, $SD = 11.39$ kg; girls: $M = 40.4$ kg, $SD = 11.81$ kg), or mean BMI (boys: $M = 19.7$, $SD = 3.98$; girls: $M = 19.2$, $SD = 3.98$). Using age and gender standards for BMI (Cole et al., 2000) the estimated prevalence of overweight was 25.5%; the estimated prevalence of obesity was 7.1%; and similar proportions of boys (68.0%) and girls (67.0%) were of normal weight. While the proportion

overweight was larger for girls (27.3%) than boys (23.0%) and the proportion obese was larger for boys (9.0%) than girls (5.8%), none of these differences were statistically significant. For Aboriginal participants, the estimated prevalence of overweight was 41.2% (boys: 56.3%; girls: 27.8%) and the estimated prevalence of obesity was 8.8% (boys: 6.3%; girls: 11.1%).

Overall, 69.9% of the participants' mothers and 44.7% of the fathers had some post secondary education. The majority of the parents or guardians surveyed considered their neighbourhoods to be "quite safe" (41.5%) or "safe" (46.5%).

Based on self-reported height and weight, 87.6% of the participants' fathers and 53.5% of the mothers were overweight or obese. Each participant's BMI category was compared to the participant's mother's and father's BMI category. For boys, a positive association was found between the boy's BMI category and the mother's BMI category [$\chi^2(c)$ (1, N = 89) = 4.38, $p = .036$]. For girls, there was a positive association between the girl's BMI category and the father's BMI category [$\chi^2(c)$ (1, N = 121) = 5.48, $p = .019$]. The proportion of overweight or obese participants (30.7%) with at least one overweight or obese parent was significantly larger than the proportion of overweight or obese participants (0.9%) whose parents were both of normal weight [$\chi^2(c)$ (1, N = 218) = 4.19, $p = .041$]. While this relationship was not statistically significant for boys (both parents of normal weight: 1.1%, one parent overweight or obese: 29.0%), the proportion of overweight or obese girls with an overweight or obese parent (32.0%) was significantly larger than the proportion of overweight or obese girls whose parents were both of normal weight (0.8%) [$\chi^2(c)$ (1, N = 125) = 4.02, $p = .045$].

Participants reported spending approximately 1-4 hours in sedentary leisure activity on school days and on the weekend, with no significant difference between boys and girls. A larger proportion of Aboriginal (42.9%) compared to non-Aboriginal (21.8%) participants reported spending, on average, > 4 hours in leisure activity on the previous weekend [χ^2 (2, N = 253) = 9.28, $p = .010$].

The mean PAQ-C score did not differ significantly between boys ($M = 3.3$, $SD = 0.64$) and girls ($M = 3.2$, $SD = 0.57$). Students who spent < 1 hour/day in leisure activity on school days ($M = 3.4$, $SD = 0.63$), however, had a higher mean PAQ-C score compared to students who spent 1-4 hours/day ($M = 3.2$, $SD = 0.60$) in leisure activity [ANOVA, $F(2, 256) = 3.53$, $p = .031$]. The mean PAQ-C score did not differ significantly by BMI category (normal weight: $M = 3.3$, $SD = 0.59$; overweight or obese: $M = 3.1$, $SD = 0.61$).

In the multiple variable logistic regression analysis, when boys and girls were considered together (Table 1, Model 1), with adjustment for the other variables in the model, significant positive associations were observed between the prevalence of overweight or obesity among participants and the variables gender, Aboriginal descent, and BMI category of the participant's mother and father, while an inverse association was observed for the variable parent's/guardian's perception of neighbourhood safety. For boys (Table 1, Model 2), the prevalence of overweight or obesity was higher for Aboriginal compared to non-Aboriginal boys and for boys whose mothers were overweight or obese compared to boys whose mothers were of normal weight. For girls (Table 1, Model 3), the prevalence of overweight or obesity was higher for girls whose fathers were overweight or obese compared to girls whose fathers were of normal weight.

Table 1

Adjusted Odds Ratio^a and 95% Confidence Interval for Overweight or Obesity^b in Participants by Logistic Regression Model and Study Variables of Interest

Variable		Model 1 All (n = 194) OR 95% CI		Model 2 Boys (n = 83) OR 95% CI		Model 3 Girls (n = 111) OR 95% CI	
Gender	Girls	4.11	1.31-12.88				
	Boys	1.00	Reference				
Aboriginal Descent	Yes	4.38	1.58-12.15	13.50	2.59-70.430	2.41	0.52-11.03
	No	1.00	Reference	1.00	Reference	1.00	Reference
Residence	Farm or Reserve	0.81	0.41-1.60	2.27	0.62-8.27	0.44	0.17-1.13
	Town	1.00	Reference	1.00	Reference	1.00	Reference
Parent's /Guardian's Perception of Neighbourhood							
	Unsafe-Moderately Safe	0.26	0.07-0.94	0.07	0.00-1.71	0.28	0.06-1.42
	Quite Safe	1.08	0.52-2.23	1.14	0.29-4.45	1.29	0.47-3.57
	Safe	1.00	Reference	1.00	Reference	1.00	Reference
Education Level of Mother							
	High school or less	0.93	0.28-3.12	0.18	0.02-1.82	2.27	0.39-13.10
	Some post secondary	0.52	0.15-1.79	0.11	0.01-1.02	1.47	0.23-9.45
	Technical training	0.98	0.32-3.03	0.11	0.01-1.09	2.56	0.52-12.70
	University degree	1.00	Reference	1.00	Reference	1.00	Reference
Education Level of Father							
	High school or less	1.30	0.35-4.89	2.75	0.23-33.13	1.91	0.27-13.40
	Some post secondary	0.35	0.05-2.42	0.95	0.04-21.01	0.74	0.04-14.16
	Technical training	1.44	0.36-5.81	1.94	0.13-29.09	3.47	0.45-26.77
	University degree	1.00	Reference	1.00	Reference	1.00	Reference
BMI Category of Mother							
	Overweight/Obese	5.10	1.56-16.73	7.21	1.60-32.51	0.75	0.28-1.97
	Normal weight	1.00	Reference	1.00	Reference	1.00	Reference
BMI Category of Father							
	Overweight/Obese	4.53	1.17-17.54	2.08	0.13-34.31	5.41	1.04-28.07
	Normal weight	1.00	Reference	1.00	Reference	1.00	Reference
Weekend Day Leisure Activity							
	> 4 hours/day	1.55	0.69-3.48	1.34	0.29-6.08	1.93	0.65-5.71
	≤ 4 hours/day	1.00	Reference	1.00	Reference	1.00	Reference
PAQ-C Score		0.75	0.40-1.38	1.80	0.52-6.26	0.45	0.18-1.1
Gender*^cBMI Mother^c							

^aResults of multiple logistic regression analysis. Adjusted crude odds ratios were not estimated for the variables age and grade because the BMI estimates on which the classification of normal weight versus overweight or obesity already take into consideration the child's age.

^bBMI categories are based on the international standards for body mass index (Cole et al., 2000).

^cStatistically significant interaction between the variables gender and BMI category of the participant's mother (p = .015). With adjustment for the other variables in the model, the odds ratio estimates were:

(1) Odds ratio = 4.11 (95% CI = 1.31 – 12.90) for boys whose mothers were overweight or obese compared to boys whose mothers were not overweight or obese.

(2) Odds ratio = 0.68 (95% CI = 0.27 – 1.71) for girls whose mothers were overweight or obese compared to girls whose mothers were not overweight or obese.

(3) Odds ratio = 5.10 (95% CI = 1.56 – 16.74) for girls whose mothers were not overweight or obese compared to boys whose mothers were not overweight or obese.

(4) Odds ratio = 0.84 (95% CI = 0.34 – 2.05) for girls whose mothers were overweight or obese compared to boys whose mothers were overweight or obese.

The multiple variable analysis revealed significant interaction between the variables gender and BMI category of the participant's mother (see Table 1, footnote c). A significantly larger proportion of boys whose mothers were overweight or obese were also overweight or obese compared to boys whose mothers were of normal weight (OR = 4.11, 95% CI = 1.31-12.90). In addition, for participants whose mothers were not overweight or obese, a larger proportion of girls were overweight or obese compared to boys (OR = 5.10, 95% CI = 1.56-16.74). Physical activity or inactivity were not found to be significant predictors of BMI category.

DISCUSSION

Prevalence of Overweight and Obesity

In this rural sample, the prevalence of overweight was 25.5% and the prevalence of obesity was 7.1%. These results are similar to previous estimates for overweight (7.7% to 35.2%) and obesity (2.3% to 19.1%) in school-aged children in Canada (Galloway, 2006; Haque et al., 2006; He & Beynon, 2006; Janssen et al., 2004; Shields, 2005; Veugelers & Fitzgerald, 2005; Willms et al., 2003). Like the previous Canadian studies, studies conducted in the United States (Davy et al., 2004; Lutfiyya et al., 2007; Ogden, et al., 2002), Australia (Booth et al., 2001), England (Rudolf et al., 2004), and Sweden (Berg, Simonsson, Brantefors, & Ringqvist, 2001) revealed wide variation in the estimated prevalence of overweight (6.8% to 22.0%) and obesity (5.0% to 17.0%) among school-aged children. The lack of a significant gender difference in the estimated prevalence of overweight and obesity in the present study is consistent with results of previous studies in Canada (Haque et al., 2006; Veugelers & Fitzgerald, 2005) and the United States (Davy et al., 2004; Ogden, et al., 2002).

There were methodological differences between the present study and the previous studies. In two previous studies, BMI data were compared to the NHANES standards (Davy et al., 2004; Ogden, et al., 2002) instead of the international standards (Haque et al., 2006; Veugelers & Fitzgerald, 2005) used in the present study. In addition, ages of the participants varied; hence, results could not be accurately compared because participants in the present study were not the same age as participants in the previous studies. Davy et al. and Veugelers and Fitzgerald studied Grade 5 students, while Haque et al. studied children aged 6 to 17 years, and Ogden et al. studied children aged ≤ 19 years.

Factors Associated with Being Classified as Overweight or Obese

Factors found consistently to have a significant association with the prevalence of overweight and obesity were self-reported Aboriginal descent and the participant's mother's and father's BMI category. In the present study, the estimated prevalence of overweight or obesity was higher for Aboriginal compared to non-Aboriginal participants. This finding is consistent with results of previous studies in Canada (Bernard et al., 1995; Hanley et al., 2000; Katzmarzyk, 2008; Katzmarzyk & Malina, 1998; Shields, 2005) and the United States (Eichner et al., 2008; Jackson, 1993) where a high prevalence of overweight (25.4% to 38.0%) was found for Aboriginal children. According to Census Canada data, in 2001, 32.9% of the total Aboriginal population in Canada was < 15 years of age. In Saskatchewan, 26% of children aged < 15 years were Aboriginal and this proportion is projected to increase to 37% by 2017 (Statistics Canada, 2005). The large proportion of overweight or obese Aboriginal children in Saskatchewan and

Canada indicates a need for health promotion and education programs aimed at reducing the prevalence of overweight and obesity in this population.

In the present study, the proportion of overweight or obese participants (30.7%) with an overweight or obese parent was significantly larger than the proportion of overweight or obese participants (0.9%) whose parents were both in the normal weight category. In previous studies in Canada (Carriere, 2003; O'Loughlin, Paradis, Renaud, Meshfedjian, & Gray-Donald, 1998), the United States (Cutting, Fisher, Grimm-Thomas, & Birch, 1999), Australia (Burke, Beilin, & Dunbar, 2001), Germany (Danielzik, Langnase, Mast, Spethmann, & Muller, 2002), Korea (Park, Yim, & Cho, 2004), and the Netherlands (Vogels et al., 2006) positive relationships were observed between parental overweight and obesity and childhood overweight and obesity. The observation, in the present study, that the proportion of overweight or obese participants whose fathers were also overweight or obese (30.8%) was significantly larger than the proportion of overweight or obese participants whose fathers were of normal weight (1.4%) is consistent with findings of previous studies (Danielzik et al., 2002; Park et al., 2004; Vogels et al., 2006) and provides support for the importance of considering familial relationships when assessing obesity patterns in children.

The large proportion of overweight or obese girls with an overweight or obese parent (32%) in the present study is consistent with results of a previous study of 9 to 12 year old inner city children in Montreal, Canada (O'Loughlin et al., 1998). The findings that, compared to boys of normal weight, boys who were overweight or obese were more likely to have an overweight or obese mother and, compared to girls of normal weight, girls who were overweight or obese were more likely to have an overweight or obese father are consistent with results of a longitudinal study of Australian youth aged 9 to 18 years (Burke et al., 2001) in which significant associations were found between the presence of overweight or obesity in fathers and daughters, fathers and sons, mothers and sons, and mothers and daughters. In a study of preschool children in Pennsylvania, Cutting et al. (1999) found a positive correlation ($r = .43$, $p < .05$) between the BMI of mothers and daughters. Female weight gain often begins after puberty. It is, therefore, possible that any real positive association regarding pattern of weight gain in girls and their mothers was not detected in the present study because the sample included mainly prepubescent girls.

Relationship between Physical Activity Level and BMI

In this study, physical activity level did not vary by BMI category. Similarly, in a study of Grade 3, 7, and 11 students in Nova Scotia, Canada, Thompson et al. (2005) found no significant association between the average amount of time involved in physical activity and the BMI category of the children. In other studies, however, normal weight children were found to be more physically active than overweight or obese children (Ball, Marshall, & McCargar, 2005; Ekelund et al., 2004; Patrick et al., 2004). The inconsistency in findings between the present study and previous studies may be due to differences in the ages of the children studied, geographic location, or instrumentation. For example, the study by Ball et al. included only urban dwelling children, while only rural dwelling children were included in the present study. Rural children, compared to urban children, may have a higher risk of becoming overweight or obese because of limited access to recreational programs and facilities (Bilinski et al., 2005; Plotnikoff et al., 2004). Differences in instrumentation between studies is another possible explanation for the inconsistent findings regarding the relationship between physical activity level and BMI.

Ekelund et al. and Patrick et al. used accelerometers to measure physical activity, while the PAQ-C was used in the present study. The PAQ-C, a self report questionnaire, may not be as sensitive as other methods, such as accelerometers, for identifying differences in physical activity levels.

In the present study, students who spent < 1 hour/day in sedentary leisure activity on school days had a higher mean PAQ-C score compared to students who spent 1-4 hours/day. In contrast, in a study of 9 to 18 year old youth in Quebec City, Canada, Katzmarzyk, Malina, Song, and Bouchard (1998) found no significant association between the self-reported duration of television viewing and physical activity level assessed using a 3 day activity record. These differences may be due to differences in the ages of the children studied, geographic location, or sample size. Katzmarzyk et al. studied a sample of 784 urban dwelling youth aged 9 to 18 years. The finding, in the present study, that the mean PAQ-C score did not differ significantly between boys and girls is consistent with results of other studies of Canadian children living in rural (Bilinski et al., 2005; Thompson et al., 2005; Tremblay et al., 2005) and urban (Ball et al., 2005; Thompson et al., 2005; Tremblay et al., 2005) settings. In Europe (Ekelund et al., 2004) and the United States (Patrick et al., 2004), however, boys were found to have significantly higher mean physical activity levels than girls. Ekelund et al., Patrick et al., and Thompson et al. used accelerometers to measure physical activity levels while Ball et al., Bilinski et al., and Tremblay et al. (2005) used a self-report questionnaire similar to the one used in the present study. Thus, inconsistencies in findings between this and other studies may be due to the differences in instrumentation.

Strengths and Limitations

The convenience sample of children in the present study might not be representative of the target rural population, which may limit the generalizability of the findings. Students and parents (or guardians) interested in physical activity and BMI may have been more likely to participate in the study compared to those not interested in the topic. Use of a self-report questionnaire to collect information on sedentary leisure activity and physical activity is another limitation of the study. Self-report relies on memory and children might not accurately recall their daily activities. Results of previous studies, however, indicate that the PAQ-C yielded an acceptable level of test-retest reliability for children aged 8 to 13 years and a moderate level of construct validity (Kowalski et al., 1997). In addition, findings of this study are similar to results of a previous study of Saskatchewan children who were of the same age and whose height and weight were measured (Tremblay et al., 2005). A strength of the present study was the use of measured rather than self-reported data on weight and height to estimate BMI. Use of measured height and weight is more accurate due to the tendency to underreport weight and over report height (Strauss, 1999). A limitation of using BMI as an indicator of overweight/obesity is that muscle, bone, and level of sexual maturation influence BMI levels (Skybo & Ryan-Wenger, 2003). Advantages of using BMI are that it is easily calculated and safe and inexpensive to obtain. Key strengths are that this study contributes to the body of knowledge on the prevalence of overweight and obesity among rural children and adds to the empirical literature on differences in the prevalence of overweight and obesity between Aboriginal and non-Aboriginal rural children in Canada. This information is important due to the rapidly increasing size of the population of Aboriginal children in Canada.

CONCLUSION

This exploratory descriptive study provided a cross-sectional view of the prevalence of overweight and obesity in a sample of rural Saskatchewan children aged 8 to 12 years. Significant findings of this study suggest that children whose parents are overweight or obese

may be more likely to be overweight or obese compared to children whose parents are of normal weight and that efforts aimed at prevention of childhood overweight and obesity must target families. Further research is needed to identify specific risk factors for parental and child overweight and obesity in rural populations. Although physical activity was not a significant predictor, lifestyle habits, including diet, physical activity, and sedentary leisure activity of both parents and children should be explored. Findings of this study conflict with results of a previous study by Plotnikoff et al. (2004) in which an inverse association was found between the prevalence of overweight and obesity of rural children and the parents' income and education levels. In the present study, parents' education level and perceived neighbourhood safety were not consistent significant predictors of overweight and obesity. In the analysis where boys and girls were considered together an inverse association was observed for the variable perceived neighbourhood safety, which is consistent with the findings of Molnar et al. (2004) who attributed decreased physical activity levels to unsafe neighbourhoods. When boys and girls were considered separately, however, perceived neighbourhood safety was not significant predictor of overweight and obesity in the present study. Findings of this and other studies support the need to develop health promotion programs aimed at reducing the prevalence of overweight and obesity among Aboriginal and non-Aboriginal children in Canada. These health promotion and education programs should involve collaboration of health professionals, educators, individuals, families, and communities in order to provide holistic and culturally appropriate programs tailored to the needs of individual children and their families.

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