

Prevalence Estimates of Overweight and Obesity in Cree Preschool Children in Northern Quebec According to International and US Reference Criteria

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The prevalence of pediatric overweight and obesity in Canada has increased dramatically since the early 1980s, creating a public health concern.¹ (Note. The terms *overweight* and *obese* are used to denote increased body mass index [BMI]. These terms are used by the International Obesity Task Force [IOTF] to identify increased BMI, but the Centers for Disease Control and Prevention [CDC] uses the terms *at-risk of overweight* and *overweight*. We appreciate the different terms used in these references; however, the terms *overweight* and *obese* are used in this manuscript for simplicity.) In Canada, childhood growth is not monitored with a national surveillance system, so prevalence estimates have been derived from local,² regional,³ and national surveys.⁴ Overweight and obesity prevalence data from Canadian children (aged approximately 6 to 12 years) and adolescents (aged approximately 13 to 17 years) have been well described,⁴⁻⁷ but recent reports have also included preschool boys and girls (aged approximately 2 to 5 years).

Data from preschool children collected during the Canadian National Longitudinal Survey of Children and Youth in the mid- to late 1990s indicated that many preschool children were overweight or obese.⁸ Among children aged 2 to 3 years, approximately 18% were overweight (but not obese) and approximately 27% were obese. Among children aged 4 to 5 years, approximately 17% were overweight (but not obese) and approximately 23% were obese.⁸ However, because heights and weights were parent-reported, the true prevalence level of obesity may have been underestimated owing to biased reporting.⁹

Recent studies that used measured height and weight data showed that about 30% of children aged 2 to 6 years (n=1370) in 2 regions of Ontario were either overweight or obese,¹⁰ and among children aged 3 to 5 years in Newfoundland and Labrador (n=4161),

Objectives. We estimated the prevalence of overweight and obesity in Cree Canadian children aged 5 years (n=1044) using international and US growth references and examined the longitudinal tracking of weight categories between ages 2 and 5 years (n=562).

Methods. Weight categories based on body mass index (calculated from measured heights and weights) were derived from the International Obesity Task Force (IOTF) and the Centers for Disease Control and Prevention (CDC) references.

Results. According to the IOTF reference, 52.9% of children were overweight (31.6%) or obese (21.3%) whereas with the CDC reference, 64.9% were overweight (27.5%) or obese (37.4%). The IOTF and CDC references provided dissimilar tracking of weight categories. Based on the IOTF reference, 4.9% of the children who were normal weight at age 2 years were obese at age 5 years. Based on the CDC reference, 14.9% of children categorized as normal weight at age 2 years were obese at age 5 years.

Conclusions. The IOTF reference provided more conservative estimates of obesity than the CDC reference, and longitudinal analyses showed dissimilar tracking of weight categories with the 2 references. Public health responses to obesity prevalence estimates should be made with awareness of methodological limitations. (*Am J Public Health.* 2007;97:311-316. doi:10.2105/AJPH.2005.073940)

16.8% of boys and 18.5% of girls were overweight while 7.8% of boys and 8.2% of girls were obese.³ Results from the Canadian Community Health Survey, which were based on measured heights and weights obtained in 2004, indicated that 13% of children aged 2 to 5 years were overweight and 6% were obese.¹¹

In North America, Aboriginal peoples are the descendants of the original inhabitants of that continent. In Canada, the term "Aboriginal peoples" is inclusive of First Nations, Inuit, and Métis. In the United States, "American Indian" and "Native American" are the terms used to describe First Nations people.¹²

Community-based surveys have indicated that First Nations children in Canada and American Indian children in the United States may be at particular risk for obesity.¹³ In the Canadian Community Health Survey, 41% of Aboriginal children aged 2 to 17 years were overweight (21%) or obese (20%), which is a greater prevalence than that seen for other ethnic groups.¹¹ There is evidence from a few small community-based studies that overweight

is prevalent in preschool First Nations children. In a published report based on measured heights and weights, 34.6% of First Nations boys (n=78) and 45.2% of First Nations girls (n=62) aged 2 to 5 years living in the remote Ontario community of Sandy Lake were overweight or obese.¹⁴ In another study that used measured data, high BMI was common among First Nations children aged 4 to 19 years (n=719) living in the Island Lake Tribal Council in Manitoba. In that study, 85% of girls aged younger than 8 years were overweight (25%) or obese (60%) and 80% of boys were overweight (28%) or obese (52%).¹⁵ The issue of excess body weight in young children is very relevant in First Nations communities given their potentially increased risk for type 2 diabetes.¹⁵⁻¹⁷

Given the public health concern of overweight and obesity in young children, there has been a call for early surveillance of childhood obesity in Canada and for longitudinal research to understand the pattern of excess weight gain.¹⁸ There are, however, several issues

concerning the definition and measurement of overweight and obesity that must be considered when surveillance and tracking are undertaken. For example, the term *obesity* refers to an excessive amount of adipose tissue in relation to lean body mass whereas *overweight* refers to excess weight in relation to height. Although the term overweight may imply a lesser degree of excess fat than is associated with obesity, no criteria exist to make this distinction.¹⁹

From a classification perspective, prevalence estimates of overweight and obesity will vary as a function of the reference population used to group children into relative weight categories.^{20,21} However, in a position paper developed by the Dietitians of Canada, Canadian Paediatric Society, College of Family Physicians of Canada, and Community Health Nurses Association of Canada,²² it was recommended that the IOTF reference²³ be used when making population-based comparisons of BMI-based weight categories whereas the CDC growth charts for the United States²⁴ should be used in clinical and community settings for individual assessments of children. These recommendations were made on the basis of expert opinion, because empirical data were lacking.²⁵

The IOTF reference used age- and gender-specific BMI cutoffs created with data from 6 international surveys of children, and statistical procedures were used to align BMI cutoffs in childhood that corresponded to adult cutoffs for overweight (BMI ≥ 25 kg/m²) and obesity (BMI ≥ 30 kg/m²). In the IOTF classification system, children are designated as *neither overweight nor obese*, *overweight*, or *obese*. The CDC growth charts, in contrast, were derived from US data exclusively and use age- and gender-specific BMI cutoffs to categorize children along the BMI continuum as *underweight* (BMI < 5th percentile), *normal weight* (BMI ≥ 5 th percentile and < 85th percentile), *at risk of overweight* (BMI ≥ 85 th percentile and < 95th percentile), or *overweight* (BMI ≥ 95 th percentile). Given that the IOTF and CDC references were developed from unique data sets and used different statistical methods and theoretical approaches, each method generates dissimilar estimates of overweight and obesity.²¹ Furthermore, because different terms are used by the IOTF and CDC to describe children in different BMI weight categories, it is often difficult to make comparisons among studies.

Few American Indian children were included in the development of the CDC reference, and none were included in the IOTF reference. Despite the inadequate representation of American Indian children, the CDC reference is used to classify them into weight categories.¹³ It is noteworthy that no Canadian data (neither Aboriginal nor non-Aboriginal) were included in the development of the IOTF and CDC standards. Unfortunately, the current lack of nationally representative measured height and weight data from Canadian children precludes the development of Canadian growth charts, so the use of methods and standards developed by other countries is required to monitor childhood overweight and obesity in Canada. The Indian and Inuit Health Committee of the Canadian Paediatric Society supports the use of CDC growth charts to monitor child growth, while recognizing that First Nations and Inuit children may have growth patterns that differ from the reference population of children who were used to derive the CDC charts.²⁶

Presently, there is limited information regarding the magnitude of overweight and obesity in preschool-aged First Nations children in Canada. There is no information of the comparability of prevalence estimates obtained with the IOTF and CDC references in young children of First Nations descent and it is unknown whether these 2 methods provide comparable longitudinal tracking of relative weight categories in First Nations children. Therefore, our objectives were 2-fold: (1) to determine the prevalence of overweight and obesity in preschool First Nations boys and girls aged 5 years living in northern Quebec with both the IOTF and CDC references, and (2) to examine the longitudinal tracking of weight categories between ages 2 and 5 years with the IOTF and CDC references in First Nations boys and girls who had heights and weights measured at both ages.

METHODS

Study Sample

The James Bay Cree of northern Quebec, who number approximately 14 000 persons, were traditionally a nomadic people. The population underwent a rapid lifestyle transition, most notably in the 1970s, with the

construction of massive hydroelectric projects. Although traditional hunting and fishing subsistence activities are still important, the Cree now live predominantly in 9 rural and remote communities along the coast and inland from James Bay between the 49th and 55th parallels in the sub-Arctic region of the province of Quebec. Because of a relatively recent shift to a sedentary lifestyle and away from traditional foods, obesity and type 2 diabetes mellitus have become highly prevalent in Cree adults,²⁷ and the prevalence of overweight among school-aged children is high.²⁸

Data Collection

In Cree communities, a routine medical examination occurs when a child aged approximately 5 years begins school. In July 2002, measured heights and weights taken at the time of this examination were retrospectively obtained from the medical charts of children born from January 1994 to July 1997. All charts were reviewed twice to ensure accuracy of data collection. Community health nurses were instructed to measure body weight to the nearest 0.1 kg (using a medical balance scale) and height to the nearest 0.1 cm (using a stadiometer). Children were measured while wearing light clothing, and shoes were removed. In total, 1252 children were born from January 1994 to July 1997 and would have had a 5th birthday by July 2002; however, 99 were excluded from the study because they had endured a serious illness or trauma, or were deceased. Of the remaining 1153 children, 1044 had measurements taken when aged between 55 and 65 months (aged approximately 5 years). In Cree communities, anthropometric measures are also taken at well-baby clinics when a child is aged 18 to 24 months; the timing of this clinic visit depends in part on physician availability. For the longitudinal aspect of this study, we included only those children who attended the clinic when aged 2 years because the IOTF reference is not applicable for younger children. Of the 1044 children, 562 were measured when aged 2 years.

The Cree Board of Health and Social Services of James Bay (Quebec) and the Human Research Ethics Board of the Faculty of Agriculture, Forestry and Home Economics at the University of Alberta approved this investigation. Members of the Research Committee of

the Cree Health Board were given the opportunity to read and comment on our findings.

Statistical Analyses

BMI (calculated as weight in kilograms divided by height in meters squared) and BMI percentiles from the CDC reference were calculated for each child using Epi Info, version 3.3 (CDC, Atlanta, Ga). To accommodate descriptive comparisons among weight categories between the 2 classification systems, the same terms were applied to results derived from both the IOTF and CDC references. The terms *overweight* and *obese* described children who measured higher than the equivalent BMI cutoffs of the IOTF reference, or age- and gender-specific BMI between the 85th percentile and lower than the 95th percentile, and BMI 95th percentile or higher of the CDC reference, respectively. The term *normal weight* was used to describe children who were not overweight or obese. There was no evidence of *underweight* as no child possessed a BMI lower than the 5th percentile on CDC growth charts.

Descriptive statistics for all continuous variables were presented as the mean \pm SD. Group comparisons were performed with the independent sample *t* test. The κ statistic was used to estimate the agreement in weight classification between the CDC and IOTF references. A positive predictive value was calculated to determine the proportion of overweight or obese children aged 5 years who were in those categories when aged 2 years. A negative predictive value was calculated to determine the proportion of normal-weight children at 5 years who had normal weight at 2 years. A *P* value less than .05 was considered significant and SPSS version 13.0 (SPSS Inc, Chicago, Ill) was used for all statistical analyses.

RESULTS

Anthropometric data for boys and girls aged 5 years and the proportions of children in each of the relative weight categories are provided in Table 1. Boys were slightly taller than girls ($P < .05$), but no other differences in anthropometry were observed. Based on the IOTF reference, 52.9% of children were either overweight (31.6%) or obese (21.3%),

TABLE 1—Anthropometric Data and Proportions of Cree Children Aged 5 Years in Relative Weight Categories Based on the International Obesity Task Force (IOTF) and Centers for Disease Control and Prevention (CDC) References: Northern Quebec, Canada, 2002

| | Boys | Girls | Total |
|--|------------------|-----------------|-----------------|
| No. | 521 | 523 | 1044 |
| Age, mo, mean \pm SD | 60.5 \pm 1.0 | 60.4 \pm 1.0 | 60.5 \pm 1.0 |
| Height, cm, mean \pm SD | 112.4 \pm 4.4* | 111.9 \pm 4.3 | 112.2 \pm 4.4 |
| Weight, kg, mean \pm SD | 22.9 \pm 4.2 | 22.5 \pm 3.9 | 22.7 \pm 4.1 |
| BMI, kg/m ² , mean \pm SD | 18.0 \pm 2.8 | 17.9 \pm 2.3 | 18.0 \pm 2.5 |
| BMI percentile on CDC growth charts, mean \pm SD | 83.4 \pm 20.4 | 85.0 \pm 16.9 | 84.2 \pm 18.8 |
| Normal weight (IOTF), % | 50.9 | 43.4 | 47.1 |
| Normal weight (CDC), % | 35.7 | 34.6 | 35.2 |
| Overweight (IOTF), % | 28.2 | 35.0 | 31.6 |
| Overweight (CDC), % | 23.8 | 31.2 | 27.5 |
| Obese (IOTF), % | 20.9 | 21.6 | 21.3 |
| Obese (CDC), % | 40.5 | 34.2 | 37.4 |

Note. BMI = body mass index.
* $P < .05$

whereas based on the CDC criterion, 64.9% were either overweight (27.5%) or obese (37.4%). The proportion of boys classified as obese using the CDC reference was twice as great as the proportion classified as obese using the IOTF reference (40.5% vs 20.9%, respectively). The difference observed in girls was smaller in magnitude, but the trend was consistent, with more girls classified as obese using the CDC reference than using the IOTF reference (34.2% vs 21.6%, respectively).

Overall, the CDC and IOTF references classified 71.9% of children the same way and the κ value was 0.58 indicating moderate agreement in classification (Table 2). All children classified as having normal weight by the CDC reference were classified the same way by the IOTF reference; however, 43.6% of children classified as overweight by the CDC reference were classified as having normal weight by the IOTF reference, and 43.0% of children classified as obese by the CDC reference were considered overweight by the IOTF reference. When weight categories were made dichotomous ("normal" and "overweight or obese") by combining the overweight and obese categories, 88.0% of children were classified the same way and the κ value was 0.76, indicating good agreement between the 2 references.

For the subgroup with longitudinal data available at both 2 and 5 years of age (Table 3), all

anthropometric indicators (in both boys and girls) increased between 2 and 5 years of age, except for absolute BMI, which decreased (all $P < .01$). In boys, the proportion of individuals classified as obese by the IOTF reference decreased slightly (21.8% to 18.8%) from 2 to 5 years of age, but increased with the CDC reference (31.7% to 40.6%). Positive changes were noted in the overweight category for both the IOTF (25.8% to 31.0%) and CDC (22.5% to 25.5%) references between 2 and 5 years of age. This resulted in a notable reduction in the normal-weight category in boys as classified by the CDC reference (45.8% to 33.9%). In girls, the proportion of individuals in the obese category decreased slightly between 2 and 5 years of age for both the IOTF (24.4% to 21.0%) and CDC (35.4% to 33.0%) references. The reduction in obesity was mostly compensated for by an increase in the overweight group for the CDC reference (24.4% to 28.5%), but corresponded to an increase in the normal-weight group for the IOTF reference (41.6% to 46.0%).

Unique patterns of change in weight categories from ages 2 to 5 years were noted between the IOTF and CDC references when data from boys and girls were combined (Tables 4 and 5). According to the IOTF reference, 4.9% of children who were classified as normal weight at 2 years of age were classified as obese at 5 years of age (Table 4). By

TABLE 2—Comparison of Agreement for Categorizing Weight Categories for Cree Children Aged 5 Years (N = 1044) Between the Centers for Disease Control and Prevention (CDC) and the International Obesity Task Force (IOTF) Reference Criteria: Northern Quebec, Canada, 2002

| | IOTF | | |
|-------------------------|----------------------------|-------------------------|--------------------|
| | Normal Weight (n = 492) | Overweight (n = 330) | Obese (n = 222) |
| CDC | | | |
| Normal weight (n = 367) | 367 (100.0) | ... ^a | ... ^a |
| Overweight (n = 287) | 125 | 162 (56.4) | ... ^a |
| Obese (n = 390) | ... ^a | 168 | 222 (56.9) |

Note. Numbers in parentheses represent the percentage of agreement in weight classification between the IOTF reference and the CDC reference.

^aNot applicable.

TABLE 3—Anthropometric Data and Proportions of Cree Children (at 2 and 5 Years of Age) in Relative Weight Categories Based on the International Obesity Task Force (IOTF) and Centers for Disease Control and Prevention (CDC) References: Northern Quebec, Canada, 2002

| | 2 Years | 5 Years | % Change |
|---|------------|-------------|----------|
| Boys | | | |
| No. | 271 | 271 | |
| Age, mo, mean ±SD | 24.8 ±0.9 | 60.4 ±0.9* | |
| Height, cm, mean ±SD | 90.1 ±3.1 | 112.4 ±4.6* | |
| Weight, kg, mean ±SD | 15.1 ±2.0 | 22.9 ±4.2* | |
| BMI, kg/m ² , mean ±SD | 18.6 ±2.0 | 18.0 ±2.7* | |
| BMI percentile on CDC growth charts, mean ±SD | 79.8 ±22.2 | 83.6 ±21.0* | |
| Normal weight (IOTF), % | 52.4 | 50.2 | -2.2 |
| Normal weight (CDC), % | 45.8 | 33.9 | -11.9 |
| Overweight (IOTF), % | 25.8 | 31.0 | +5.2 |
| Overweight (CDC), % | 22.5 | 25.5 | +3.0 |
| Obese (IOTF), % | 21.8 | 18.8 | -3.0 |
| Obese (CDC), % | 31.7 | 40.6 | +8.9 |
| Girls | | | |
| No. | 291 | 291 | |
| Age, mo, mean ±SD | 24.8 ±0.9 | 60.4 ±0.9* | |
| Height, cm, mean ±SD | 89.1 ±3.0 | 112.2 ±4.2* | |
| Weight, kg, mean ±SD | 14.8 ±1.9 | 22.4 ±3.7* | |
| BMI, kg/m ² , mean ±SD | 18.6 ±1.9 | 17.8 ±2.3* | |
| BMI percentile on CDC growth charts, mean ±SD | 81.4 ±21.6 | 83.2 ±18.6* | |
| Normal weight (IOTF), % | 41.6 | 46.0 | +4.4 |
| Normal weight (CDC), % | 40.2 | 38.5 | -1.7 |
| Overweight (IOTF), % | 34.0 | 33.0 | -1.0 |
| Overweight (CDC), % | 24.4 | 28.5 | +4.1 |
| Obese (IOTF), % | 24.4 | 21.0 | -3.4 |
| Obese (CDC), % | 35.4 | 33.0 | -2.4 |

Note. BMI = body mass index.

*P < .01

contrast, 14.9% of children categorized as normal weight when aged 2 years according to the CDC reference were considered obese when aged 5 years (Table 5). Of the children who were classified as obese according to the IOTF reference at 2 years of age, 53.8% remained obese at 5 years of age (Table 4). However, of children grouped as obese according to the CDC reference at 2 years of age, 70.9% remained obese at 5 years of age (Table 5). The positive predictive value, indicating the probability that children classified as overweight or obese at 5 years of age would be classified that way at 2 years of age was 72.6% for the IOTF reference and 81.3% for the CDC reference. The negative predictive value, indicating the probability that children classified as normal weight at 5 years of age would be classified as normal weight at 2 years of age was 71.5% for the IOTF reference and 59.8% for the CDC reference.

DISCUSSION

Using anthropometric measurements of Cree preschool children in northern Quebec, Canada, we compared prevalence estimates of overweight and obesity according to 2 different growth references and tracked patterns of BMI-based weight categories during the preschool period. We found that prevalence estimates for overweight and obesity in children were high, regardless of the reference used to classify children. However, the CDC reference provided higher estimates of obesity compared with the IOTF reference, although differences in the prevalence of overweight were smaller in magnitude. In addition, we found that the categorization of children into different relative weight groups according to the IOTF and CDC criteria differed between boys and girls. The IOTF and CDC references also revealed unique patterns of change in relative weight categories as children progressed from 2 to 5 years of age, which provided evidence for disparate patterns of tracking of relative weight categories with BMI.

Consistent with other reports that compared estimates of overweight and obesity in preschool children with the CDC and IOTF references,^{20,21} our study revealed that the IOTF reference provided a more conservative estimate of obesity in relation to the CDC

TABLE 4—Tracking of Relative Weight Categories in Cree Children Between 2 and 5 Years of Age (N = 562) Classified According to the International Obesity Task Force Reference Criteria: Northern Quebec, Canada, 2002

| | 5 Years | | |
|-------------------------|----------------------------|-------------------------|--------------------|
| | Normal Weight (n = 270) | Overweight (n = 180) | Obese (n = 112) |
| 2 Years | | | |
| Normal weight (n = 263) | 188 (71.5) | 62 | 13 |
| Overweight (n = 169) | 69 | 71 (42.0) | 29 |
| Obese (n = 130) | 13 | 47 | 70 (53.8) |

Note. Numbers in parentheses represent the percentage of agreement in weight classification at 5 years of age with that at 2 years of age.

TABLE 5—Tracking of Relative Weight Categories in Cree Children Between 2 and 5 Years of Age (N = 562) Classified According to the Centers for Disease Control and Prevention Reference Criteria: Northern Quebec, Canada, 2002

| | 5 Years | | |
|-------------------------|----------------------------|-------------------------|--------------------|
| | Normal Weight (n = 204) | Overweight (n = 152) | Obese (n = 206) |
| 2 Years | | | |
| Normal weight (n = 241) | 144 (59.8) | 61 | 36 |
| Overweight (n = 132) | 46 | 50 (37.9) | 36 |
| Obese (n = 189) | 14 | 41 | 134 (70.9) |

Note. Numbers in parentheses represent the percentage of agreement in weight classification at 5 years of age with that at 2 years of age.

appropriateness of comparing longitudinal data to criteria generated using independent measurements can be questioned. However, one of the primary objectives of the CDC reference was the development of growth curves to track childhood growth in clinical settings.²⁴

From a public health standpoint, it is clear that different reference criteria can reveal dramatic differences in prevalence estimates of pediatric obesity. If a growth reference does not adequately describe the population in question, public health concerns may be spuriously increased or decreased, leading to inappropriate (or lack of) action.³⁰ Furthermore, when strategies are designed to reduce rates of pediatric overweight and obesity, or if studies are planned to examine changes in growth, the use of different references may correspond to differences in the ability to detect changes over time. As a means of addressing the limitations inherent in the relative BMI categorizations, it would be prudent to express any changes over time in both categorical (normal weight, overweight, or obese) and absolute terms and not rely on a single indicator.³¹ This information would be useful given that an increase or decrease in absolute BMI could take place but not correspond to a change in weight category if individuals do not cross BMI threshold cutoffs.

Our study has several strengths. We determined prevalence estimates from a large sample of young children representative of the Cree communities in northern Quebec, and BMI was calculated from measured rather than reported heights and weights. The study was both a cross-sectional and a longitudinal examination of overweight and obesity in pre-school-aged First Nations boys and girls (to date, an understudied population of children). The limitations of the study relate to the accuracy of the data that were collected. Although a standard protocol for measuring children existed, not all community nurses may have adhered to it. Furthermore, numerous staff used a variety of stadiometers and weight scales to perform measurements. However, we do not anticipate that these limitations resulted in large or systematic errors in data collection.

Our data underscore the high prevalence of overweight and obesity in Canadian pre-school children and show that the magnitude of the problem may be substantial among First

reference. In the present study, Cree boys aged 5 years were 1.94-times more likely to be classified as obese by the CDC method than by the IOTF method (40.5% vs 20.9%) while girls were 1.58-times more likely to be classified as obese by the CDC than by the IOTF method (34.2% vs 21.6%). In comparison, Flegal et al.²¹ found that boys aged 2 to 5 years included in the National Health and Nutrition Examination Survey III (1988–1994) were 1.78-times more likely to be classified as obese using the CDC than using the IOTF reference (6.2% vs 2.5%), whereas girls of that age were 1.95-times more likely to be classified as obese (8.2% vs 4.2%, respectively). In children from Newfoundland and Labrador aged 3 to 5 years, Canning et al.²⁰ found that boys were 2.48-times more likely to be classified as obese by the CDC method than by the IOTF method (19.4% vs 7.8%), whereas girls were 2.01-times more likely to be classified as obese (16.5% vs 8.2%, respectively). On the basis of these observations, caution must be taken when

comparing absolute levels of obesity in pre-school children with the different methods.

There has been limited study of the tracking of relative weight categories in young children. In our analyses, absolute BMI in both boys and girls decreased between 2 and 5 years of age while the CDC BMI percentiles increased. This finding may appear counterintuitive, but the relationship between BMI and age is curvilinear and tends to decrease from 2 years of age until 5 to 6 years of age (this period has been termed the adiposity rebound²⁹) before increasing in a near linear fashion until young adulthood is achieved. According to the CDC growth charts, the majority of children who were obese at 2 years of age remained in that same weight category at 5 years of age, whereas the normal weight category was most stable according to the IOTF reference. However, for both the CDC and IOTF references, the overweight category showed the least stability. Cross-sectional data were used to generate both the IOTF and CDC references, so the

Nations boys and girls. The high levels of overweight and obesity we found reinforce the case for increased efforts at preventing and decreasing childhood obesity. There is also a clear need to identify the factors that contribute to the onset and persistence of childhood overweight and obesity in Cree and other First Nations children, including the need to understand linkages between changes in growth and changes in food intake and physical activity. We echo recent sentiments made by others^{9,10} in the need for collecting measured height and weight data among representative samples of Canadians as a means of accurately determining the prevalence of overweight and obesity. The lack of Canadian data are particularly relevant to Aboriginal children, given the large and growing population of Aboriginal peoples in Canada,³² reported high rates of overweight and obesity in Aboriginal children in both Canada and the United States,^{11,13} and evidence for potentially unique growth patterns in aboriginal children.^{33–35} Health practitioners working with First Nations and American Indian children should be careful when assessing childhood obesity and be cognizant of the fact that comparisons of BMI with reference standards may lead to inappropriate risk assessments. ■

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Contributions

N.D. Willows and G.D.C. Ball originated the study and wrote the article. M.S. Johnson collected the data and contributed to the statistical analysis of data.

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Human Participant Protection

The Cree Board of Health and Social Services of James Bay (Quebec) and the human research ethics board of the Faculty of Agriculture, Forestry and Home Economics at the University of Alberta approved this investigation.

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