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Résumé

Alors qu'on signale des taux de plus en plus élevés d'excès de poids et d'obésité chez les enfants d'âge scolaire et les adultes au Canada, il existe peu d'études portant sur ce problème chez la population d'âge préscolaire. La présente étude vise à déterminer la prévalence d'excès de poids et d'obésité chez une population provinciale d'enfants canadiens âgés de 3,5 à 5,5 ans. L'indice de masse corporelle (IMC) a été calculé chez 4 161 enfants d'âge préscolaire à partir du poids et de la taille mesurés par des infirmières en santé publique dans le cadre du Programme de vérification de la santé préscolaire à la grandeur de la province. Des données descriptives sur l'IMC des enfants ont été créées et analysées selon le sexe et l'âge au moyen des méthodes IOTF et CDC. Plus de vingt-cinq pour cent des enfants d'âge préscolaire présentent dès l'âge de trois ans et demi un excès de poids ou de l'obésité. Ces résultats indiquent que des mesures préventives doivent être mises en place très tôt dans la vie de l'enfant si l'on souhaite s'attaquer efficacement au problème de l'obésité.

Overweight and obesity in preschool children in Newfoundland and Labrador

INTRODUCTION

Overweight and obesity are global health problems. In Canada, recent reports indicated that 57.0% of adult men and 35.0% of adult women were overweight or obese.¹

Overweight and obesity are major risk factors for cardiovascular problems such as heart disease and stroke, as well as type 2 diabetes, gall bladder disease, and some cancers.

Overweight and obesity also place children at risk for these same diseases, not only in later adulthood, but while still in childhood and adolescence.² Children and adolescents are also particularly vulnerable to the social and emotional consequences of overweight and obesity.³ Research has shown that obese children are at a greater risk for obesity in adulthood. Sixty-nine percent of children between the ages of 6 and 10 years with a Body Mass Index (BMI) greater than the 95th percentile will continue to be obese in their adult life.⁴ The economic cost of overweight and obesity is also high. The annual cost of overweight- and obesity-related health problems in Canada has been estimated at \$3.5 billion⁵, significant in a country with a population of approximately 30 million.

The rates of childhood and adolescent overweight and obesity are high and rising throughout the developed world. In Australia, data collected in 1985 and 1995 showed that the prevalence of overweight and obesity among 7- to 15-year-olds went from

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10.7% to 20.0% among boys, and from 11.8% to 21.5% among girls.⁶ The United States reported similarly increasing rates of overweight and obesity over the same time period⁷ and, that the trend is continuing.⁸ Canada has also reported that among school-aged children, rates of overweight and obesity combined have increased from 15.0% in both boys and girls in 1981, to 35.4% and 29.2% in 1996, respectively.⁹

Newfoundland and Labrador has the highest overall provincial rate of adult overweight and obesity at 39.0%, compared to the national average of 29.4%.¹⁰ Consistent with the prevalence of overweight and obesity, this Province has the highest provincial rate of type 2 diabetes¹¹ and the highest mortality rate in the country due to cardiovascular disease, including heart disease and stroke.¹² Parental overweight and obesity are among the most significant risk factors for childhood overweight and obesity. Thus Newfoundland and Labrador children and adolescents are at greater risk of developing overweight and obesity and the associated short- and long- term health problems, than are children in the other Canadian provinces.

It has been shown that intervention after overweight and obesity have become established is often unsuccessful.¹³ Therefore, it is important to determine at what age unhealthy body weights begin to emerge. From the few studies of overweight and obesity that include preschool children, there is some indication that a trend of increasing weight is also occurring in this age group. For example, Ogden, Flegal, Carroll, and Johnson⁸, found that the prevalence of obesity (defined in that study as

>95%ile) increased from 7.2% in 1988-94, to 10.4% in 1999-2000, among 2- to 5-year-olds. Similarly, a Canadian study reported that more than 20.0% of approximately 300 participants in a preschool program were either overweight or obese (defined in that study as >90%ile).¹⁴ Given that the rates of overweight and obesity reported among the Newfoundland and Labrador school-aged population are high, examination of the prevalence among younger age groups is necessary in order to determine when these problems emerge. This information is needed if the Province is to address these problems effectively through appropriately timed prevention and early intervention measures.

WHAT WERE THE OBJECTIVES OF THE STUDY?

1. To determine the prevalence of overweight and obesity among preschool-aged children in Newfoundland and Labrador.
2. To determine the prevalence of overweight and obesity using measured heights and weights, as opposed to parental reports.
3. To establish a baseline from which future trends in overweight and obesity can be monitored.
4. To establish a baseline from which prevention and intervention measures may be evaluated.
5. To help establish the age at which overweight and obesity emerge.

HOW WAS THE DATA OBTAINED?

The Regional Health and Community Services Boards of Newfoundland and Labrador provided the data for this study. Data were obtained from the records of children born in 1997, and who participated in the Preschool Health Check Program, a province-wide screening program conducted by public health nurses prior to school entry. This is an important and successful program with more than 90.0% of eligible children participating each year. As part of the screening, all children have their weight and height measured by the nurse using a standard protocol. The date of the Preschool Health Check, the child's date of birth, sex, height and weight were obtained from Program records. Although all children were born in 1997, due to the variability in the timing of the Preschool Health Check, children's ages ranged from 3.5 to 5.5 years.

HOW WERE OVERWEIGHT AND OBESITY DEFINED?

Body Mass Index was calculated from height and weight measures, according to the standard formula (weight in kilograms/height in metres²). In order to make the data most useful for comparison, and to contribute to the understanding and refinement of international standard definitions of overweight and obesity, both the US Centers for Disease Control (CDC)¹⁵ and the International Obesity Task Force (IOTF)¹⁶ methods were used to classify each child, according to his/her BMI, as "overweight", "obese", or "normal". There are no nationally-representative Canadian reference data for children of preschool age, based on measured heights and weights.

IOTF method

Cole, Belizzi, Flegal and Dietz ¹⁶ have published a set of BMI cut-off points that are age- and sex-specific and define overweight and obesity for children aged 2 to 18 years.

These cut-off points were developed based on the results of large-scale, national studies from six countries. The cut-off points were modified for children but were developed to correspond to those accepted for adults, specifically a BMI of 25 or greater for overweight and a BMI of 30 or greater for obesity. For example, a BMI of 17.55 in a four-year-old boy is equivalent to an adult BMI of 25, and a classification of overweight. A BMI of 19.29 would be equivalent to an adult BMI of 30 and thus would classify that four-year-old boy as obese. Each child in the study was assigned a classification of “overweight”, “obese” or “normal”, according to the cut-off point chart published by Cole et al.¹⁶

CDC method

Using the software program provided by the CDC, an age- and sex-specific BMI percentile score was calculated for each child. ¹⁵ Each child was then assigned a classification of “overweight”, “obese” or “normal”, according to whether the child’s BMI percentile rank was at the 85th percentile but below the 95th percentile, greater than or at the 95th percentile, or below the 85th percentile, respectively. The CDC percentile charts were derived primarily from the US National Health Examination Survey conducted from 1963 to 1994 and thus are representative of the United States population. However, they are widely accepted as a reference for normal healthy growth for children in the

west. Although the CDC prefers the terms “at risk for overweight” and “overweight”, for the purposes of clarity and comparison, the terms “overweight” and “obese” are used in this study.

WHO WERE THE CHILDREN?

Data were received for 4469 children born in 1997. Due to missing information on 308, the final sample size was 4161. This represents 77.0% of the 1997 birth cohort¹⁷ and 79.0% of the number of children subsequently enrolled in kindergarten in 2002¹⁸. Boys and girls were equally represented (50.1% and 49.9%, respectively). Representation of the Health and Community Services Regional Boards ranged from 57.1% to 84.3%. Further description of the sample is presented in Table 1.

Table 1
Means and Standard Deviations for Height, Weight and BMI for the Sample, by Sex and Age Group.

Group	N	Height (cm)	Weight (kgs)	BMI
All	4161	105.8 (5.0)	18.7 (3.2)	16.6 (2.1)
Boys	2083	106.3 (4.9)	19.0 (3.2)	16.8 (2.0)
Girls	2078	105.2 (5.0)	18.4 (3.3)	16.5 (2.1)
<i>42-54 months</i>				
Boys	1720	105.7 (4.7)	18.8 (3.1)	16.8 (2.0)
Girls	1734	104.5 (4.7)	18.1 (3.1)	16.5 (2.1)
<i>55-66 months</i>				
Boys	363	109.2 (4.7)	19.9 (3.4)	16.6 (2.0)
Girls	344	108.6 (5.5)	19.5 (3.7)	16.5 (2.3)

WHAT WERE THE MAJOR FINDINGS?

1. The rates of overweight and obesity were high, whether determined by the IOTF or CDC method (See Table 2).
2. There were no significant differences between boys and girls in the prevalence of overweight or obesity as estimated by either the IOTF method or the CDC method. The prevalence of overweight and obesity combined was significantly higher in boys than in girls, in the 42- to 54- month-old age group, but only as estimated using the CDC method.

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3. Overall, there were no significant differences among age groups in the prevalence of overweight or obesity as estimated by either the IOTF method or the CDC method.

Table 2
Prevalence (%) of Overweight (95% Confidence Intervals) by Sex and Age Group, Comparing IOTF and CDC Methods of Classification.

Group (n)	IOTF*			CDC**		
	overweight	obese	combined	overweight	obese	combined
All (4161)	17.6 (16.4-18.8)	8.0 (7.2-8.8)	25.6 (24.3-26.9)	18.0 (16.8-19.2)	18.0 (16.8-19.2)	36.0 (34.5-37.5)
Boys (2083)	16.8 (15.2-18.4)	7.8 (6.6-9.0)	24.6 (22.8-26.4)	17.5 (15.9-19.1)	19.4 (17.7-21.1)	36.9 (34.8-39.0)
Girls (2078)	18.5 (16.8-20.2)	8.2 (7.0-9.4)	26.7 (24.8-28.6)	18.5 (16.8-20.2)	16.5 (14.9-18.1)	35.0 (32.9-37.1)
42-54 months						
Boys (1720)	17.2 (15.4-19.0)	7.7 (6.4-9.0)	24.9 (22.9-26.9)	17.6 (15.8-19.4)	19.9 (18.0-21.8)	37.5 (35.2-39.8)
Girls (1734)	18.7 (16.9-20.5)	8.0 (6.7-9.3)	26.7 (24.6-28.8)	18.7 (16.9-20.5)	16.6 (14.8-18.4)	35.3 (33.1-37.5)
55-66 months						
Boys (363)	14.6 (11.0-18.2)	8.3 (5.5-11.1)	22.9 (18.6-27.2)	17.4 (13.5-21.3)	16.8 (13.0-20.6)	34.2 (29.3-39.1)
Girls (344)	17.7 (13.7-21.7)	9.3 (6.2-12.4)	27.0 (22.3-31.7)	17.2 (13.2-21.2)	16.3 (12.4-20.2)	33.5 (28.5-38.5)

* IOTF as defined by the Cole et al.¹⁶ cut-off points

**CDC definitions: overweight ($\geq 85^{\text{th}}$ and $< 95^{\text{th}}$) and obese ($\geq 95^{\text{th}}$)

DO RATES OF OVERWEIGHT AND OBESITY DIFFER ACCORDING TO THE METHOD USED TO DEFINE THEM?

While both methods yielded high estimates of overweight and obesity overall, there were a number of differences between the two methods.

1. The overall estimates of overweight and obesity (combined) using the CDC method was 36.0%, 10 percentage points higher than the IOTF estimate of 26.0%. This difference was significant.
2. Both boys and girls were 1.63 times more likely to be classified as overweight or obese (combined) using the CDC method, as compared to the IOTF method.
3. Both boys and girls were more than twice as likely to be classified as obese using the CDC method as compared to the IOTF method.
4. A boy was 2.85 times more likely to be classified as obese by the CDC method than by the IOTF method.
5. A girl was 2.20 times more likely to be classified as obese by the CDC method than by the IOTF method.

WHAT DOES THIS RESEARCH TELL US?

This study represents the first province-wide report on the prevalence of overweight and obesity among preschool-aged children based on directly measured heights and weights in Canada.

The results indicate that a high percentage of Newfoundland and Labrador preschool-aged children are already overweight or obese, regardless of the method used to classify them. The more conservative estimate, the IOTF method, indicates that one in four preschool-aged children in Newfoundland and Labrador is already overweight or obese. Although there are no provincially-representative data available from other provinces, the prevalence rates reported in this study, derived by the IOTF method, are similar to reports for preschool children in other countries based on measured heights and weights. Bundred, Kitchiner, and Buchan¹⁹, using national data as a reference, reported a prevalence of overweight and obesity of 23.6% among preschoolers aged 2.9 to 4.0 years in the United Kingdom. Similarly, Magarey, Daniels and Boulton⁶ using the IOTF method, reported that 18.0% of 2-6 year-old Australian children were overweight or obese.

The rates of overweight and obesity for preschool-aged children reported in this study may be indicative of the problem nationally. While Willms, Tremblay, and Katzmarzyk²⁰ reported that the eastern provinces, including Newfoundland and Labrador, had the highest rates of childhood overweight and obesity in both 1981 and 1996. During that

period, rates also increased in every part of Canada. They also concluded that the risk of being overweight was more related to the secular trend than to demographic or geographic variables. By 1996, provincial estimates of overweight and obesity ranged from 23.5 to 39.0% with 9 of 10 provinces doubling their rates during that period. Recent reports²¹ of prevalence among teenagers in Canada indicate that the trend is continuing.

IMPLICATIONS

These results indicate that prevention measures must begin before preschool age if the problem of overweight and obesity is to be addressed successfully. The data provide a basis upon which future trends in the Newfoundland and Labrador population may be monitored and against which prevention measures may be evaluated.

WHAT NEXT?

It was an aim of this study to help determine the age at which overweight and obesity emerge in children and to establish the prevalence among preschoolers in Newfoundland and Labrador. Clearly these results indicate the need to examine the prevalence of overweight and obesity in children younger than 3.5 years. These results showed that for the 3.5 year-olds, the youngest in this study, overweight and obesity are already problems for at least one quarter of these children. Reports²² from the US have indicated that children younger than two years are showing a trend toward a higher weight-for-height.

In places like Newfoundland & Labrador, other parts of Canada, and other countries with well-developed health and community nursing systems, monitoring and prevention measures could be incorporated into existing prenatal and child health programs.

Similarly, collaborations between community, government and university, such as the one that enabled this study, can support that monitoring and ensure that policy and program evaluation is part of the process.

The Preschool Health Check is a very successful provincial program with more than 90.0% of eligible preschoolers taking part. These high rates of participation indicate that this program offers a valuable opportunity to monitor preschool children's health and development and provide parents with information that will assist them in raising healthy children. In the long-term, early monitoring and intervention should help to reduce health care costs in the adult population.

On the national level, monitoring of overweight and obesity based on measured heights and weights, and including children of all ages, is needed in order to estimate the magnitude of the problems accurately and to permit monitoring of trends and the evaluation of prevention and intervention measures. The results of this study highlight that further examination is needed to determine which internationally accepted classification method provides a more appropriate reference standard for the Canadian population, that of the CDC, which is based on the American population, or the internationally-based IOTF.

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