

Comparison of Anthropometry and Parent-reported Height and Weight Among Nine Year Olds

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ABSTRACT

Background: There is mounting evidence that the prevalence of overweight and obesity in children is reaching epidemic proportions in North America. We compared parent-report vs. measured BMI overweight and obesity prevalence estimates among 9 year olds using the 1996 NLSCY reports published by Willms et al. (2003) and anthropometric measurements from a regional population of public school children.

Methods: Body mass index (BMI) was calculated for 1,497 9-year-old children (males N=734; females N=763) from 75 public schools in the Niagara Region of Ontario, Canada. BMI from the 1996 NLSCY was based on parental reports of height and weight of 879 nine year olds. To define overweight and obese children, we used internationally accepted age- and gender-specific cut-offs as defined by Cole et al. (2000).

Results: The NLSCY overweight prevalence estimates of boys and girls may overestimate overweight boys and girls by 17% and 10%, respectively. Measured obesity prevalence estimates were similar to parent-reports.

Conclusions: Our results suggest that parental reports of height and weight may inflate prevalence estimates of overweight children, but appear reasonably accurate for estimating obesity. Since prevalence of overweight and obesity are often combined to form a global estimate, reliance on parent-reported height and weight may overstate the magnitude of the problem.

MeSH terms: Children; obesity; overweight; body weights and measures; anthropometry; body mass index; epidemiology

La traduction du résumé se trouve à la fin de l'article.

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Recent work by Willms and colleagues (2003)¹ comparing the 1981 Canadian Fitness Survey (CFS) to the 1996 National Longitudinal Survey of Children and Youth (NLSCY) demonstrates an approximately threefold increase in the national prevalence of overweight and obesity among Canadian children 7 to 13 years old during this time period. This is based on overweight and obese body mass index (BMI (kg/m²)) categories commonly used to gauge the prevalence of weight problems in youth.²⁻⁴

The 1981 CFS used direct measures of child height and weight to compute BMI⁵ while the 1996 NLSCY BMI calculations were based principally* on parental reports of height and weight. Previous studies have shown that adult self-reports of height and weight are unreliable^{6,7} as are their reports of their child's height and weight.⁸ For example, Spencer et al. (2002) found that obese adults were least likely to be correctly classified as obese.⁷ Moreover, Goodman et al. (2000) found that 34% of obese teens were not identified by self-reported or parent-reported height and weight.⁸

As such, whether the substantial reported rise in the prevalence of child overweight and obesity represents a true increase or is a function of the shift from anthropometric measurements in 1981 (CFS) to parental reports in 1996 (NLSCY) is open to debate. In an attempt to address this issue, we compare the 1996 BMI rates among 9 year olds calculated from parent-reported height and weight (as reported by Willms et al., 2003) to BMI rates calculated from measured height and weight in a school population of 9 year olds.

METHODS

Parent-reported height and weight sample

The calculated BMI scores based on parent-estimated height and weight in the 1996 NLSCY⁹ are used as the basis for comparison. The 1996 NLSCY⁹ contains children from newborn to age 13. Using a multi-staged, stratified random sampling

* As indicated by Willms et al. (2003), there were a small number of children in the NLSCY whose height and weight were measured directly. However, these authors cannot say what the percentage of these cases was and there is no way to identify them in the database.

TABLE I

Nine-year-old Male and Female Prevalence of Overweight and Obesity Based on BMI Values Derived from the NLSCY and Measured Anthropometry from a Regional School Population

	1996 NLSCY*					Regional Public Schools in Niagara				
	N	Mean BMI	SD	% Overweight	% Obese	N	Mean BMI	SD	% Overweight	% Obese
Males	432	18.9	4.7	36†	14	734	18.3	3.3	19†	11
Females	447	18.7	4.8	33‡	12	763	18.6	3.7	23‡	13

Note: NLSCY = National Longitudinal Survey of Children and Youth

SD = standard deviation

* Derived from Willms et al., 2003

† Proportions are significantly different at $p < 0.001$

‡ Proportions are significantly different at $p < 0.01$

procedure, participating households were chosen from Statistics Canada’s Labour Force Survey. Children living in Indian reserves, military housing, institutions, and remote northern areas were excluded from the NLSCY. One person from each household was selected as the “person most knowledgeable” (PMK), usually the mother, to provide detailed information on the child, including height and weight. From this information, BMI was calculated for each child. Overweight and obese BMI categories were defined using international age- and gender-specific cut-offs.² In order to make a comparison with the current data (see below), we restricted our analysis to the 879 nine year olds in the NLSCY (males N=432; females N=447).

Measured height and weight sample

The target population of children in our comparison sample consisted of the entire grade four cohort from the District School Board of Niagara (DSBN). Children with physical disabilities (i.e., wheelchairs and walkers) that limited their participation in the Leger shuttle run¹⁰ were excluded. Research ethics approval was granted by both Brock University and the DSBN review boards, and consent to enter schools was obtained from school principals. Of a potential cohort of 2,534 students in grade 4 from 75 schools, parents of 2,303 (91%) provided consent. In this study, we analyzed the results of 1,497 children who were 9 years old at the time of data collection in the fall of 2004 (males N=734; females N=763). We excluded 806 8- and 10-year-old children as they would not be representative of all 8 and 10 year olds, the majority of them being one grade behind (Grade 3) or ahead (Grade 5) and not included in the target population cohort.

Anthropometric measurements of height (cm) and weight (kg) were made on all

children. Standing height was measured without footwear to the nearest 0.5 cm using a wall-mounted stadiometer. Weight was measured in clothing (without shoes) required for light physical exercise to the nearest 0.1 kg using a calibrated, electronic scale. Normal, overweight, and obese BMI categories, based on measured height and weight (kg/m²), were based on the same age- and gender-specific cut-offs developed by Cole and colleagues² and used in the NLSCY analysis.¹ A z-statistic was used to test for differences in prevalence estimates across samples.

RESULTS

Table I shows the prevalence of overweight and obesity in 9-year-old males and females based on reported and measured BMI values. Results provided from Willms et al. (2003) are weighted sample estimates from the NLSCY.

The estimate of obesity prevalence in the school sample did not differ significantly from the NLSCY. However, a significant difference in prevalence estimates was found in the overweight BMI category. The parent-reported NLSCY prevalence of overweight 9 year olds was 17% and 10% higher for males and females, respectively, compared to the measured school sample.

DISCUSSION

This analysis partially supports previous findings that parental reports of their children’s height and weight are unreliable,⁸ specifically for the overweight category. This suggests that overweight population estimates from the 1996 NLSCY may be significantly overstated. However, our results agree with the obesity estimates reported by Willms et al. (2003).

To address this discrepancy within the overweight category, we consider one possible explanation. Accurately reporting the height and weight of one’s child is quite difficult.⁸ Troiano and colleagues (1995)¹¹ examined overweight childhood trends and noted that a narrow height and weight range is required to accurately classify a child as overweight. Nine-year-old children are considered overweight if their BMI falls between 19.1 and 22.77 for males and between 19.07 and 22.81 for females.² Since the classification of obese is bounded only by a lower cut-off, slight over- or underestimates in parent-reported height and weight are not as likely to shift a child out of this category. Moreover, parents with obese children may be more aware of their weight issues and more able to provide accurate reporting.

Although our results suggest that current youth overweight prevalence rates may overestimate the true rate, we are limited by the comparison of regional data to national data. These anthropometric estimates could be different from Canadian estimates. Notwithstanding this, in a recent Statistics Canada report,¹² St. Catharines was identified as having the 10th highest percentage of obese adults (17.2%) among CMAs (Census Metropolitan Area) and was higher than the Canadian average (14.9%), suggesting that the differences reported here may be conservative. While adult obesity estimates do not translate directly to child estimates, there is a link between obesity in childhood and subsequent obesity in adulthood.¹³ The proposed Canadian Health Measures Survey (CHMS) by Statistics Canada and the Canadian Community Health Survey (CCHS) will permit a direct national comparison of prevalence estimates derived from direct measurement and parental reports of child

and adult height and weight.¹⁴ However, the CCHS 2.1 does not include children under the age of 12. Moreover, the CHMS has recently received Health Canada ethics approval and conducted a dress rehearsal in Ottawa in preparation for its full nationwide implementation (Personal Communications, CHMS Fall 2006, Issue 10, and Spring 2007, Issue 11 newsletters).

These findings are important from a public health perspective in addition to being important methodologically. When rates of obesity are reported in the media, overweight and obese categories often are combined, providing estimates that may exaggerate the extent of the problem.¹⁵ Our combined estimates indicate a third of the pediatric population is at risk, almost 20% less than that previously reported.¹ The prevalence rates we find still indicate an increase in overweight and obese children from the 1981 CFS study,¹⁶ albeit smaller than previously reported. As such, it is vital from a public health perspective to note that childhood obesity is increasing and we must continue to focus on reversing this trend.

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RÉSUMÉ

Contexte : Il apparaît de plus en plus que le surpoids et l'obésité chez les enfants prennent des proportions épidémiques en Amérique du Nord. Nous avons comparé les estimations de prévalence du surpoids et de l'obésité chez les enfants de 9 ans, selon les déclarations parentales et selon la mesure directe de l'indice de masse corporelle (IMC) des enfants, en nous aidant des rapports tirés de l'Enquête longitudinale nationale sur les enfants et les jeunes (ELNEJ) de 1996 publiés par Willms et coll. (2003) et des mesures anthropométriques d'une population régionale d'enfants fréquentant l'école publique.

Méthode : Nous avons calculé l'IMC de 1 497 enfants de 9 ans (734 garçons et 763 filles) fréquentant 75 écoles publiques de la région de Niagara, en Ontario (Canada). Les IMC figurant dans l'ELNEJ de 1996 étaient fondés sur les déclarations parentales de la taille et du poids de 879 enfants de 9 ans. Pour catégoriser les enfants obèses et ceux présentant un surpoids, nous avons utilisé les seuils de démarcation selon l'âge et le sexe définis par Cole et coll. (2000), qui sont internationalement acceptés.

Résultats : Les estimations de prévalence du surpoids chez les garçons et les filles selon l'ELNEJ pourraient surestimer (de 17 % chez les garçons et de 10 % chez les filles) la proportion d'enfants présentant un surpoids. Par contre, les estimations de prévalence de l'obésité tirées des mesures anthropométriques et des déclarations parentales étaient semblables.

Conclusion : Ces résultats donnent à penser que les déclarations parentales de la taille et du poids pourraient gonfler les estimations de prévalence du surpoids chez les enfants, mais que ces estimations sont raisonnablement précises pour ce qui est de l'obésité. Comme on combine souvent la prévalence du surpoids et de l'obésité pour produire une estimation globale, on risque de surestimer l'ampleur du problème si l'on se fie aux déclarations parentales de la taille et du poids.