

# Validity of Self-Reported Weight and Height among 13–14 Year Old Schoolchildren in Israel

Yifat Linhart MD MPH<sup>1,2</sup>, Orly Romano-Zelekha MSc<sup>3</sup> and Tamy Shohat MD MPH<sup>2,3</sup>

<sup>1</sup>Tel Aviv District Health Office, Ministry of Health, Tel Aviv, Israel

<sup>2</sup>Department of Epidemiology and Preventive Medicine, Sackler Faculty of Medicine, Tel Aviv University, Ramat Aviv, Israel

<sup>3</sup>Israel Center for Disease Control, Ministry of Health, Tel Hashomer, Israel

**ABSTRACT:** **Background:** Data regarding the validity of self-reported weight and height in adolescents are conflicting. **Objectives:** To evaluate the validity of self-reported weight and height among 13–14 year old schoolchildren. **Methods:** We conducted a cross-sectional study of 517 schoolchildren aged 13–14 years and compared self-reported and measured weight and height by gender, population group, parental education and crowdedness. **Results:** Females under-reported their weight on average by  $0.79 \pm 5.46$  kg ( $P = 0.03$ ), resulting in underestimation of the body mass index with borderline significance (mean difference  $0.28 \pm 2.26$  kg/m<sup>2</sup>,  $P = 0.06$ ). Males over-reported their height on average by  $0.75 \pm 5.81$  cm ( $P = 0.03$ ). Children from less crowded homes ( $\leq 1$  person per room) overestimated their height more than children from more crowded homes, resulting in a significant underestimation of BMI (mean difference between reported BMI and measured values was  $0.30 \pm 2.36$  kg/m<sup>2</sup>,  $P = 0.04$ ). Measured BMI was a significant predictor of the difference between self-reported and measured BMI, adjusted for gender, population group, parents' education, and crowdedness ( $\beta = -0.3$ ,  $P < 0.0001$ ). As a result of this reporting bias, only 54.9% of children with overweight and obesity (BMI  $\geq$  85th percentile) were classified correctly, while 6.3% of children were wrongly classified as overweight and obese. The largest difference in BMI was observed in obese females ( $4.40 \pm 4.34$ ) followed by overweight females ( $2.18 \pm 1.95$ ) and underweight females ( $-1.38 \pm 1.75$ ). Similar findings were observed for males, where the largest difference was found among obese males ( $2.83 \pm 3.44$ ). **Conclusions:** Studies based on self-reported weight and height in adolescents may be biased. Attempts should be made to correct this bias, based on the available data for each population.

IMAJ 2010; 12: 603–605

**KEY WORDS:** body mass index, weight, height, validity, schoolchildren

Self-reported weight and height are common epidemiologic parameters that are used as an alternative to direct measurements both in adults and adolescents. Conflicting results were reported from studies conducted in adolescents. Some found under-reporting of weight and over-reporting of height [1,2], while others found that both height and weight were under-reported [3,4]. The validity of self-reported weight and height in adolescents has not been assessed in Israel. The aim of the present study was to assess the validity of these parameters among 8th grade schoolchildren in Israel.

## PATIENTS AND METHODS

The Israel Center for Disease Control, in collaboration with the Ministry of Education, conducted a national study in 2003 to evaluate the prevalence of asthma in a representative sample of 8th grade schoolchildren in Israel [5]. We collected information on children's height and weight in 11 randomly selected schools. All children were measured and weighed by the school nurses. Body mass index was calculated by dividing weight in kilograms by height (m<sup>2</sup>). BMI percentile was determined using a standard growth chart published and developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion, Center for Disease Control in 2000 [6]. Self-reported and measured weight, height and calculated BMI were compared by gender, population group, parental education, and crowdedness (defined as the number of persons per room) as an indicator of socioeconomic level. Population groups were "Jews and others" ("others" include non-Arab Christians) and Arabs (Moslems, Christians, Druze and Bedouins). We excluded from the analysis questionnaires where the differences between self-reported and measured height and weight were larger than 4 standard deviations from the mean differences as reported before [7].

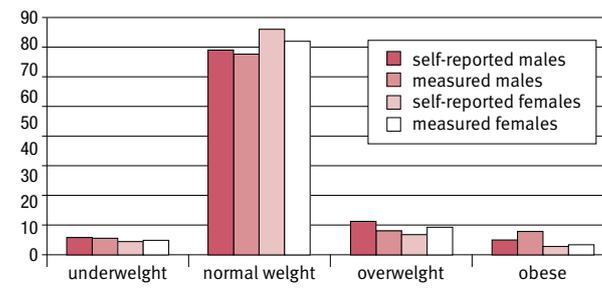
## RESULTS

Of the 947 schoolchildren measured, 532 had reported their weight and height (56%). Fifteen questionnaires were excluded

BMI = body mass index

since the differences between self-reported and measured height and weight were larger than 4 SD from the mean differences. Analysis of responders and non-responders revealed that parents' education was in general lower in non-responders compared with responders ( $P = 0.03$ ). In addition, compliance of Arab schoolchildren was better than of Jewish schoolchildren ( $P < 0.0001$ ). Females underestimated their weight on average by  $-0.79 \pm 5.46$  kg ( $P = 0.03$ ), resulting in underestimation of the BMI (mean difference  $-0.28 \pm 2.26$  kg/m<sup>2</sup>,  $P = 0.06$ ). Males overestimated their height on average by  $0.75 \pm 5.81$  cm ( $P = 0.03$ ), and their weight by  $0.60 \pm 6.91$  kg ( $P = 0.15$ ); There were no significant changes in reported versus measured BMI (mean difference  $0.04 \pm 2.39$  kg/m<sup>2</sup>,  $P = 0.8$ ). Significant correlations were observed between the reported and measured height and weight in both genders (Pearson's correlation coefficients ranged between 0.76 and 0.84 for all parameters, in males and females). Children in families where one parent had  $\leq 12$  years of education and the other  $> 12$  years significantly underestimated their weight, on average, by  $-0.89 \pm 4.57$  kg ( $P = 0.04$ ). This resulted in underestimation of BMI by an average of  $-0.31 \pm 1.70$  kg/m<sup>2</sup> ( $P = 0.05$ ). Correlations between self-reported and measured parameters were lower in children of parents with low educational level ( $\leq 12$  years) compared to parents with a higher educational level. Children from less crowded homes ( $\leq 1$  person per room) significantly overestimated their height (mean difference  $0.72 \pm 5.65$  cm,  $P = 0.04$ ), resulting in a significant underestimation of BMI (mean difference  $-0.30 \pm 2.36$  kg/m<sup>2</sup>,  $P = 0.04$ ). An overestimation, albeit not statistically significant, of weight was observed in children from more crowded homes ( $0.45 \pm 5.25$  kg,  $P = 0.22$ ). Population group differences between self-reported and measured weight and height were not statistically significant. Overestimation of height was on average 0.3 cm among Jews and others and 0.5 cm among Arabs. Correlations between self-reported and measured parameters were higher among Jews and others compared with Arabs. Measured BMI was a significant predictor of the difference between self-reported and measured BMI, adjusted for gender, population group, parents' education, and crowdedness ( $\beta = -0.3$ ,  $P < 0.0001$ ). The largest difference between means of self-reported and measured BMI was observed in obese females ( $4.40 \pm 4.34$  kg/m<sup>2</sup>) followed by overweight females ( $2.18 \pm 1.95$  kg/m<sup>2</sup>) and underweight females ( $-1.38 \pm 1.75$  kg/m<sup>2</sup>). Similar findings were observed for males, where obese males ( $2.83 \pm 3.44$  kg/m<sup>2</sup>) demonstrated the largest difference among males. Significant differences between mean differences were observed between most of the BMI percentile groups in females except between overweight vs. obese and underweight vs. normal weight females ( $P < 0.008$  for other groups). In males, significant differences were observed between obese and underweight males and between obese and normal weight males ( $P < 0.008$ ). Based on self-reported weight and height, 7.3%

**Figure 1.** Self-reported and measured BMI by BMI category in females and males (y axis: %)



of females were overweight and 2.6% were obese [Figure 1]. Based on measured weight and height 10.3% were overweight and 3.5% were obese. In males, reported overweight was 12.1% and measured overweight was 8.9%, while obesity was 5.3% (self-reported) and 8.9% (measured). These differences were not significantly different. As a result of this reporting bias only 54.9% of children with overweight and obesity (BMI  $\geq 85$ th percentile) were classified correctly, while 6.3% with normal BMI or underweight were classified as overweight/obese. The sensitivity of self-reported weight and height for being overweight/obese (BMI  $\geq 85$ th percentile) was 50% in females and 58% in males. The specificity was 96.5% for females and 91.3% for males, the positive predictive value 69.6% and 59.2% for females and males, respectively, and the negative predictive value 92.3% for females and 90.9% for males.

## DISCUSSION

In the present study BMI based on self-reported weight and height was slightly underestimated in females, but not in males. The degree of bias correlated with the BMI categories. The sensitivity of self-reported weight and height for predicting overweight and/or obesity (BMI  $\geq 85$ th percentile) was low. High correlations were found in the present study between self-reported and measured weight, height and BMI in females and males; however, high correlations do not necessarily indicate valid results, as previously reported [8-10]. Although there were some differences between responders and non-responders in parents' education and population group, these parameters were not associated with the dependent variable and therefore did not bias the results significantly.

In conclusion, self-reported weight and height in adolescents can be misclassified, especially in certain subgroups, resulting in bias estimates of overweight and obesity. This should be considered when analysing data from large self-reported surveys. Some of the results in the present study did not reach statistical significance possibly due to the small sample size. We recommend that this study be repeated in a larger population group in Israel.

---

**Corresponding author:**

**Dr. Y. Linhart**

Tel Aviv District Health Office, Ministry of Health, 12 Ha'arba'a St., Tel Aviv  
61203, Israel

**Phone:** (972-3) 563-4711

**Fax:** (972-3) 563-4840

**email:** yifat.linhart@telaviv.health.gov.il

**References**

1. Brener ND, Mcmanus T, Galuska DA, Lowry R, Wechsler H. Reliability and validity of self-reported height and weight among high school students. *J Adolesc Health* 2003; 32: 281-7.
2. Giacchi M, Mattei R, Rossi S. Correction of the self-reported BMI in a teenage population. *Int J Obes Relat Metab Disord* 1998; 22: 673-7.
3. Strauss RS. Comparison of measured and self-reported weight and height in a cross-sectional sample of young adolescents. *Int J Obes Relat Metab Disord* 1999; 23: 904-8.
4. Himes JH, Faricy A. Validity and reliability of self-reported stature and weight of US adolescents. *Am J Hum Biol* 2001; 13: 255-60.
5. Romano-Zelekha O, Graif Y, Garty BZ, Livne I, Green MS, Shohat T. Trends in the prevalence of asthma symptoms and allergic diseases in Israeli adolescents: results from a national survey 2003 and comparison with 1997. *J Asthma* 2007; 44(5): 365-9.
6. Centre of Disease Control, 2000 growth charts: United States: <http://www.cdc.gov/GROWTHCHARTS/>.
7. Niedhammer I, Bugel I, Bonenfant S, Goldberg M, Leclerc A. Validity of self-reported weight and height in the French GAZEL cohort. *Int J Obes Relat Metab Disord* 2000; 24: 1111-18.
8. Tokmakidis SP, Christodoulos AD, Mantzouranis NI. Validity of self-reported anthropometric values used to assess body mass index and estimate obesity in Greek school children. *J Adolesc Health* 2007; 40: 305-10.
9. Tsigilis N. Can secondary school students' self-reported measures of height and weight be trusted? An effect size approach. *Eur J Public Health* 2006; 16: 532-5.
10. Elgar FJ, Roberts C, Tudor-Smith C, Moore L. Validity of self-reported height and weight predictors of bias in adolescents. *J Adolesc Health* 2005; 37: 371-5.