

## Stabilisation of the prevalence of childhood obesity in Switzerland

Isabelle Aeberli<sup>a,b</sup>, Isabelle Henschen<sup>a</sup>, Luciano Molinari<sup>c</sup>, Michael B. Zimmermann<sup>a</sup>

<sup>a</sup> Human Nutrition Laboratory, ETH Zürich, Switzerland

<sup>b</sup> Clinic for Endocrinology, Diabetes and Clinical Nutrition, University Hospital Zürich, Switzerland

<sup>c</sup> Child Development Centre, University Children's Hospital, Zurich, Switzerland

The Swiss Federal Office of Public Health is gratefully acknowledged for financing this study.

### Summary

**Background:** The prevalence of childhood obesity is increasing rapidly in most industrialised countries, but several countries, including Switzerland, have recently reported a levelling off or even a reversal of this alarming trend.

**Study aim:** Our aim was to evaluate the prevalence of childhood obesity in a national sample of Swiss school children recruited to assess iodine nutrition and with this to reconfirm a recently shown stabilising trend.

**Design:** Using a probability-proportionate-to-size cluster sampling, 6 to 12 year old children (n = 907) were recruited in a study of iodine status in Switzerland. Height and weight were measured and body mass index calculated in all children.

**Results:** The prevalence of overweight detected was 12.5% (SE = 1.6) in boys and 12.8% (1.6) in girls while 6.2% (1.1) of boys and 4.2% (0.9) of girls were classified as obese. The highest prevalence of overweight and obesity were found in the Southern region and in bigger cities (>100000 inhabitants). Compared to the most recent national study in 2007, the prevalence was slightly higher, but the differences were not significant, suggesting negative sampling bias does not strongly affect surveys of paediatric adiposity in Switzerland.

**Conclusion:** This present study clearly confirms the stabilisation of the prevalence of childhood overweight and obesity in Switzerland.

**Key words:** overweight; obesity; children; Switzerland

### Introduction

In many industrialised and industrialising countries, the prevalence of childhood overweight is increasing [1, 2]. However, recently several countries, including Switzerland, France, Sweden, Italy and the US, have reported stabilisation or decline in the prevalence of childhood overweight [3–7]. In Swiss school age children we found a significant decrease in the prevalence of overweight in girls and of obesity in both genders between 2002 and 2007 [7]. In the period between these studies there was increased media attention on child overweight and many Swiss schools began intervention programmes aimed at reducing its prevalence. In cross-sectional studies designed to estimate the prevalence of overweight in children, a negative bias may occur if more overweight children than normal weight children decline to participate due to concerns of stigmatisation [5]. Parents may not give consent if they feel the study may focus unwanted attention on their overweight child. We recently had the opportunity to reassess the current childhood obesity prevalence by measuring heights and weights in a national sample of Swiss children who were recruited as part of a survey of iodine nutrition.

### Subjects and methods

A probability-proportionate-to-size cluster sampling based on current census data was used to obtain a nationally representative sample of 900 Swiss children aged between 6 and 13 years. This sample represents about 1 in 700 children in this age group in Switzerland (Swiss Federal Department of Statistics, personal communication). The country was divided in five regions: South (Italian language), Northeast (German language), Northwest (German language), Central east (German language) and West (French language). Further, all communities were grouped into strata by population size: <10,000, between 10,000 and 100,000 and >100,000 inhabitants. By stratified random selection, 30 schools were identified across Switzerland. After acceptance of participation of the schools, two or three classes (depending on class sizes) were randomly selected from each school and all students from those classrooms were invited to participate.

Ethical approval was obtained from the Swiss Federal Institute of Technology, Zürich, Switzerland. Written informed consent was obtained from all parents or guardians of the participating children and oral assent was obtained from the children.

Before the measurements the subjects removed their shoes as well as pullovers, emptied their pockets and wore only light indoor clothing. Height and weight were then measured using standard anthropometric techniques [8]. Body weight was measured to the nearest 0.1 kg by using a digital scale (BF 18; Beurer, Ulm, Germany) calibrated with standard weights. Height was measured to the nearest 0.1 cm by using a portable stadiometer (Seca 214, Seca Medizinische Waagen und Messsysteme, D-Hamburg). BMI was calculated as weight (kg) divided by height<sup>2</sup> (m). All measurements were done by one trained investigator.

To define overweight and obesity the 85<sup>th</sup> and 95<sup>th</sup> BMI for age CDC reference percentiles were used [9]; these have previously been validated in Swiss primary school children [10]. Statistical analysis was performed using SPLUS 8.0 (Enterprise Developer, Insightful Corporation, Seattle, WA, USA), SPSS for Windows (version 16; SPSS Inc, Chicago, IL, USA) as well as EXCEL 2003 (Microsoft Corp., Redmond, USA). Chi-square test was used to check for significant differences in prevalence in 2002, 2007 and 2009. The level of significance was set at 0.05.

## Results and discussion

The number of participating schools was 29. The response rate of the children differed greatly from school to school, but overall it was 53%. The data of 42 children had to be excluded for different reasons: 32 children were older than 13 years, for 6 no date of birth was given and therefore the age was unknown and for 4 height or weight could not be measured. The final number of children included for the data analysis was 907, 455 boys and 452 girls. The mean age was 10.0 y  $\pm$  1.6 and 9.9 y  $\pm$  1.6 and the mean BMI 17.5 kg/m<sup>2</sup>  $\pm$  2.8 and 17.6 kg/m<sup>2</sup>  $\pm$  2.6 for boys and girls respectively and there were no overall significant gender differences for age, weight, height or BMI. For comparison, table 1 shows the prevalence of overweight and obesity in the three national studies in Switzerland over the past eight years. A significant decrease in prevalence had been found between the years 2002 and 2007 for overweight girls and for obesity in both genders (p < 0.05) [7]. The overweight and obesity prevalence determined for the present study, however, were not significantly different from either the 2002 or the 2007 data. The power of the study to detect a 50% difference in the overweight and obesity prevalence between 2002 and 2009 was 90% and 80%, respectively. Thus, although the study was not powered to detect small differences in prevalence, it still supports the contention that the prevalence of childhood adiposity did not change in Swiss schoolchildren between 2002 and 2009. Similar trends have been reported in neighbouring countries [3, 5, 11].

Divided by geographic regions, the highest prevalence for both overweight and obesity was found in the southern region (17.9% and 11.9%, respectively), but the difference only reached significance for obesity compared to all except the western region (northeast: p = 0.007, northwest: p = 0.001, central east: p = 0.004). The lowest prevalence, again for overweight and obesity, was detected in the north western region (10.8% and 2.5%, respectively). Demographic comparisons showed the highest prevalence of overweight and obesity in cities with >10,000 inhabitants (25.0% and 8.3%, respectively). For overweight the differences to both smaller strata were significant (p = 0.003 for both comparisons) but for obesity they were not. In medium and small towns the prevalence reached 11.4 and 12.9% for overweight and 5.5 and 4.9% for obesity. Whilst in the first national study in 2002 comparisons between the different geographic clusters and demographic strata showed no significant differences, the distribution was found to be less uniform in 2007. The southern region showed the highest overweight prevalence and large towns with >100,000 inhabitants were more affected by obesity compared to smaller cities. Consistent with previous results, in the present study we detected the highest prevalence of overweight but also obesity in the southern region as well as in the largest cities.

A potential limitation of prevalence data from adiposity surveys is possible negative bias due to non-participation by overweight children because of fears of stigmatisation. This issue has been raised in the interpretation of recent longitudinal studies of paediatric obesity in France [5]. However, such volunteer bias was not found in a study done in the US that demonstrated that it is possible to obtain an accurate estimate of obesity prevalence in school children using active parental consent procedures [12]. Our most recent 2007 Swiss survey [7], was specifically designed to determine the prevalence of overweight and obesity among Swiss schoolchildren and thus the title of the study on the information material for parents and children clearly indicated this intent. This focus may have persuaded some parents of overweight children or the children themselves to decline participation. We have no data on the relative participation rates of overweight vs. normal weight children in the 2007 study or the present study, but the rather impressive decrease in overweight and obesity mainly in girls in 2007 compared to 2002 suggest a possible non-respondent bias in this group. Although the overall participation rate in the present study was lower than in the 2007 study, the reason for children not to participate in the present study was less likely due to their weight status, although this cannot be ruled out completely. Thus, our findings confirm the apparent stabilisation of the prevalence of childhood overweight and obesity in a sample of Swiss schoolchildren, which is unlikely to be biased.

We would like to thank the teachers and children at the participating schools for their cooperation.

*Correspondence:*  
*Isabelle Aeberli*  
*Institute of Food Science and Nutrition, Human Nutrition Laboratory*  
*ETH Zurich, LFV D11, Schmelzbergstrasse 7*  
*CH-8092 Zürich*  
*Switzerland*  
*E-Mail: isabelle.aeberli@ilw.agrl.ethz.ch*

## References

- 1 Branca F, Nikogosian H, Lobstein TJ. The challenge of obesity in the WHO European Region and the strategies for response. In: Organization WH, ed. Copenhagen, Denmark, 2007.
- 2 WHO. Obesity: Preventing and Managing the Global Epidemic. Technical Report Series. Geneva: WHO, 2000.
- 3 Lazzeri G, Rossi S, Pammolli A, Pilato V, Pozzi T, Giacchi MV. Underweight and overweight among children and adolescents in Tuscany (Italy). Prevalence and short-term trends. *J Prev Med Hyg.* 2008;49:13–21.
- 4 Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003–2006. *JAMA.* 2008;299:2401–5.
- 5 Peneau S, Salanave B, Maillard-Teyssier L, et al. Prevalence of overweight in 6- to 15-year-old children in central/western France from 1996 to 2006: trends toward stabilization. *Int J Obes (Lond)* 2009.
- 6 Sjoberg A, Lissner L, Albertsson-Wikland K, Marild S. Recent anthropometric trends among Swedish school children: evidence for decreasing prevalence of overweight in girls. *Acta Paediatrica.* 2008;97:118–23.
- 7 Aeberli I, Amman RS, Knabenhans M, Molinari L, Zimmermann MB. Decrease in the prevalence of pediatric adiposity in a 5-year prospective national study in Switzerland. *Public Health Nutr* (in press) 2009.
- 8 WHO. Physical status: the use and interpretation of anthropometry. Report of a WHO expert committee 1995.
- 9 Ogden CL, Kuczmarski RJ, Flegal KM, et al. Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version. *Pediatrics* 2002;109:45–60.
- 10 Zimmermann MB, Gubeli C, Puntener C, Molinari L. Detection of overweight and obesity in a national sample of 6–12-y-old Swiss children: accuracy and validity of reference values for body mass index from the US Centers for Disease Control and Prevention and the International Obesity Task Force. *Am J Clin Nutr.* 2004;79:838–43.
- 11 Sundblom E, Petzold M, Rasmussen F, Callmer E, Lissner L. Childhood overweight and obesity prevalences levelling off in Stockholm but socioeconomic differences persist. *Int J Obes.* 2008;32:1525–30.
- 12 Crosbie A, Eichner J, Moore W. Body mass index screening and volunteer bias. *Annals of Epidemiology.* 2008;18:602–4.

**Table 1**

Overweight and obesity prevalence in Swiss schoolchildren from three national studies conducted 2002, 2007 and 2009.

	<b>Overweight (ow)</b>	<b>Obese (ob)</b>	<b>ow + ob</b>
2009 <sup>1</sup>			
Boys (n = 455)	12.5 (1.6) <sup>2</sup>	6.2 (1.1)	18.7 (1.8)
Girls (n = 452)	12.8 (1.6)	4.2 (0.9)	17.0 (1.8)
2007 <sup>3</sup>			
Boys (n = 1083)	11.3 (0.94)	5.4 (0.67) <sup>4</sup>	16.7 (1.1) <sup>4</sup>
Girls (n = 1139)	9.9 (0.87) <sup>4</sup>	3.2 (0.52) <sup>4</sup>	13.1 (0.98) <sup>4</sup>
2002 <sup>3</sup>			
Boys (n = 1169)	12.5 (0.96)	7.4 (0.8)	19.9 (1.2)
Girls (n = 1235)	13.2 (0.96)	5.7 (0.7)	18.9 (1.1)

<sup>1</sup> 2009: Swiss Iodine Survey in school-aged children

<sup>2</sup> in percentage (standard error), all such values

<sup>3</sup> 2007 and 2002: National study to determine the prevalence of overweight and obesity in schoolchildren in Switzerland [7, 10]

<sup>4</sup> significantly different from 2002