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## Overweight and lifestyle among 13–15 year olds: A cross-sectional study in northern Sweden

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### Abstract

**Aim:** To increase knowledge of self-rated health and lifestyle in relation to overweight/obesity among 13–15 year olds in northern Sweden. **Methods:** a ll 6768 13–15 year olds in nine out of 15 municipalities in Västerbotten County were asked to complete a cross-sectional school-based on-line survey in 2007. Eighty-two per cent participated in the study. Responses were considered reliable for 74% of the participants (2517 boys/2470 girls). The survey addressed demography, self-rated health, self-reported weight, height, and lifestyle characteristics. Simple and multiple logistic regression analyses were used. **Results:** Overweight/obesity (ISO body mass index  $\geq 25$  kg/m<sup>2</sup>) was more prevalent among boys (20%) than girls (11%), but more girls (19%) than boys (9%) reported fair or bad health. Overweight/obese boys and girls were more often physically inactive. For the boys, overweight/obesity was also associated with skipping breakfast, insufficient tooth brushing, and using snuff. For the girls, overweight/obesity was also associated with living with one parent and more television watching. Boys reported healthier habits concerning sleep duration, physical activity, eating breakfast, and smoking compared to the girls. On the other hand, girls reported better dietary and tooth brushing habits. **Conclusions:** **This study uncovered two alarming findings: a fifth of the boys were overweight/obese and a fifth of the girls reported fair or bad health. Girls living with a single parent and boys and girls with unhealthy lifestyles were more likely to be overweight. Our findings emphasise the need for developing and implementing effective health promotion strategies for school-aged children to prevent an overweight and obesity epidemic that could continue into adulthood.**

**Key Words:** Adolescent, body mass index, cross-sectional, health promotion, lifestyle

### Background

Obesity among children and adolescents increases the risk for chronic diseases and results in serious public health problems. The prevalence of obesity is increasing in most parts of the world, although it is higher in welfare states [1,2]. Worldwide, 10% of school-aged children are overweight and 2.5% are obese [1]. The prevalence of overweight among children differs across Europe; for example, in northern Europe prevalence of overweight among children is between 10 and 20%, and in southern Europe prevalence is between 20 and 30% [3]. Compared to the rest of the world, Sweden has a low prevalence of

overweight and obesity among children. Between 1980 and 2003, however, overweight and obesity prevalence among children has increased twofold [4]. Recently, the trend has shifted in specific regions of Sweden for specific groups. The prevalence of overweight and obesity decreased among 10- and 11-year-old girls living in Stockholm and Göteborg in 2008, as well as among 4-year-old children living in northern Sweden (Västerbotten County) in 2009 [5–7].

Childhood obesity, in particular, has some early and later consequences. Early consequences include

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changes in appearance, psychosocial problems, metabolic disturbances, skin alterations, and physical immobility leading to decreased physical activity. Later consequences include obesity in adulthood, cardiovascular diseases, type 2 diabetes, hypertension, metabolic disorders, cancer, and an increased risk of premature mortality [8,9]. Although genetic factors and medical conditions contribute to weight gain, an unhealthy lifestyle plays an important role in development of overweight and obesity [10], e.g. consuming high-fat and energy-dense foods, skipping breakfast, a poor nutritional diet, poor sleeping patterns, and a sedentary lifestyle [11–13]. According to the Nordic Nutrition Recommendations from 2004, children should consume fewer sweets, sodas, ice cream, cakes, and snacks (a reduction of 50%) and children should take part in physical activity for at least 1 hour per day [14]. Clearly, society needs to implement effective health promotion interventions for children. However, designing these interventions is difficult because of the inconsistent findings for the prevalence of overweight and obesity with respect to lifestyle indicators and regional differences. Several studies have addressed various descriptive data about overweight and lifestyle among children, but none to the best of our knowledge has given attention to lifestyle factors and self-rated health associated with overweight among adolescents in neither Scandinavia nor Sweden.

## Aim

Our study aims to increase knowledge of self-rated health and lifestyle in relation to overweight and obesity among adolescents aged 13–15 years in northern Sweden.

## Methods

### Subjects

In October 2007, all adolescents attending lower-secondary schools (grades 7, 8, and 9 corresponding to 13, 14, and 15 years of age) in well-defined geographical areas in Västerbotten County, were invited to participate in a cross-sectional school-based on-line survey. The total population of adolescents in this age group in all 15 municipalities in the county was 10,432. In our study, including nine municipalities, 6768 adolescents were invited approaching 65% of all adolescents in the county. The overall response rate was 82% ( $n=5546$ ). Respondents with vague answers such as “I don’t know” and “other” were excluded ( $n=108$ ), as well as those with out-of-range weights and heights, body mass index (BMI)  $>50 \text{ kg/m}^2$ , and

missing data ( $n=451$ ). The remaining 4987 (74%) adolescents, 2517 boys and 2470 girls, were the final study subjects.

### Ethical issues

Informed consent was given by each participant, and reporting is done on group level not revealing results on an individual level. Ethical approval was obtained from the regional ethical review board in Umeå, Sweden.

### Survey

The on-line survey was administrated by the Development and Field Research unit within Social Services of Umeå municipality (UFFE). Each adolescent entered the system using a unique code, which was accepted only once and not identifiable. All questions had to be responded in consecutive order. Out of 82 questions, only 21 were used for the present study. The questions covered the following areas: demographic data and self-rated health, self-reported weight, height, and lifestyle, such as dietary habits, tooth brushing, sleeping patterns, TV watching, physical activity, and tobacco, alcohol, and drug use.

### Definitions

**Demography.** Gender was categorised into boys and girls. Age was defined using grade in school (grade 7, 8, and 9, corresponding to 13, 14, and 15 years of age). Parental status was categorised into households with two adults (i.e., mother and father, father and someone else, mother and someone else), or one adult (i.e., only one parent at a time; only mother or only father, or alternately with the mother and the father). Country of birth was categorised into Sweden or other countries.

**Self-rated health.** General health was categorised into good (very good and quite good), fair, and bad (quite bad and very bad).

**Body mass index.** BMI was calculated by dividing bodyweight (kg) by height (in meters squared) using self-reported weight and height. BMI was categorised and divided into the following groups: underweight:  $\leq 18.49 \text{ kg/m}^2$ ; normal weight:  $18.50\text{--}24.99 \text{ kg/m}^2$ ; overweight:  $25.0\text{--}29.99 \text{ kg/m}^2$ ; and obesity:  $\geq 30.0 \text{ kg/m}^2$ . Overweight and obesity was determined using age- and sex-specific cut-off points determined by Cole et al. [15], corresponding to adult BMI of 25 and  $30 \text{ kg/m}^2$ , respectively. Accordingly, the ISO

BMI cut-off points for overweight for boys were 21.91 kg/m<sup>2</sup> (13 years), 22.62 (14 years), and 23.29 kg/m<sup>2</sup> (15 years), and for girls 22.58 (13 years), 23.34 (14 years), and 23.94 kg/m<sup>2</sup> (15 years). The ISO BMI cut-off points for obesity for boys were 26.84 (13 years), 27.63 (14 years), and 28.30 kg/m<sup>2</sup> (15 years), and for girls 27.76 (13 years), 28.57 (14 years), and 29.11 kg/m<sup>2</sup> (15 years).

*Lifestyle.* Breakfast during schooldays was categorised into  $\geq 4$  times/week or  $\leq 3$  times/week. Fruits and vegetables intake were categorised into  $\geq 1$  time/day, 3–6 times/week, or  $\leq 2$  times/week. Sweets and snacks consumption was categorised into  $< 1$  time/day or  $\geq 1$  time/day. Tooth brushing was categorised into twice a day or more often and once a day or more seldom. Sleep duration was calculated by the differences between time rising from bed and bed-time and was categorised into  $\geq 9$  hours/night or  $< 9$  hours/night. TV watching during schooldays was categorised into  $< 3$  hours/day or  $\geq 3$  hours/day. Physical activity included activity at clubs or sport centres during spare time that resulted in shortness of breath and sweating:  $\geq 3$  times/week, 1–2 times/week, or less than once a week (sometimes per month, per year, or never). Smoking and using snuff was categorised into no or yes (very seldom to every day). Alcohol and drug use was categorised into no or yes (tried once or more often).

### Statistics

The data from boys and girls were analysed separately. Results of the descriptive analyses are presented as numbers, percentages, and means. Pearson chi-squared tests and Student t-tests were used to analyse sex differences for categorical and numerical variables, respectively. Simple logistic regression analyses were used to evaluate any association of potential risk factors with overweight/obesity. Variables significant at the level 0.05 were considered relevant; however, in the multiple regressions, variables with *p*-values below 0.10 in the simple logistic regressions were included. The results were expressed as odds ratios with a 95% confidence interval. The program STaTa for Windows (version 10.0) was used in the analyses.

### Results

Overweight/obesity (ISO BMI  $\geq 25$  kg/m<sup>2</sup>) was more prevalent among boys (20%) than girls (11%), but more girls (19%) than boys (9%) reported fair or bad health. Overweight/obese boys and girls were more

often physically inactive. For the boys, overweight/obesity was also associated with skipping breakfast, insufficient tooth brushing, and using snuff. For the girls, overweight/obesity was also associated with living with one parent and more television watching. A unhealthy lifestyle was common although very few reported eating sweets and snacks and using drugs. Boys reported healthier habits concerning sleep duration, physical activity, eating breakfast, and smoking compared to girls. On the other hand, girls reported better dietary and tooth brushing habits.

### Demographic characteristics and self-rated health

Almost all of the participants were born in Sweden (96% boys and 97% girls), and 77% of both boys and girls were living with two adults (Table I). A vast majority of the participants rated their general health as good, although the boys reported this to a higher extent than the girls (91% and 81%, respectively). More girls (5%) than boys (2%) reported their general health as bad (Table I).

### Overweight and obesity

In general, overweight and obesity was more prevalent among boys (20%) than girls (11%) in all age groups (Table II). Overweight alone was most prevalent among 14-year-old boys and girls (20% and 10%, respectively), and obesity alone was most prevalent among 15-year-old boys and girls (4% and 3%, respectively) (Table II).

### Lifestyle indicators

In general, girls had more health-enhancing dietary habits compared to the boys concerning consumption of fruits, vegetables, sweets, and snacks; boys, however, reported eating breakfast more often than the girls (Table III). Tooth brushing at least twice a day was more prevalent among girls (86%) than boys (78%). More than one-quarter of the adolescents watched TV 3 or more hours per day. The boys reported taking part in sports during their spare time more often than the girls (44% and 37%, respectively) (Table III).

A high proportion never had smoked tobacco or used drugs, although smoking (very seldom to every day) was more prevalent among girls (16%) than boys (13%) (Table III). Consumption of alcohol and the use of snuff, however, were more common for both sexes, since nearly half of them had at least tried alcohol once and had at least used snuff (very seldom) (Table III).

Table I. Demographic characteristics and self-rated health among adolescents aged 13–15 years in Västerbotten, Sweden.

Variable	Boys ( <i>n</i> =2517)	Girls ( <i>n</i> =2470)	<i>p</i> -value <sup>a</sup>
Age (years)			
13	837 (33)	829 (33)	0.667
14	829 (33)	785 (32)	
15	851 (34)	856 (35)	
Country of birth			
Sweden	2419 (96)	2388 (97)	0.278
Other countries	98 (4)	82 (3)	
Parental status			
Two adults	1947 (77)	1899 (77)	0.692
One adult	570 (23)	571 (23)	
Self-rated health			
Good	2284 (91)	2012 (81)	<0.001
Fair	180 (7)	333 (14)	
Bad	53 (2)	125 (5)	

Values are *n* (%). <sup>a</sup>Pearson chi-squared test.

Table II. Overweight and obesity among adolescents aged 13–15 in Västerbotten, Sweden.

	Boys ( <i>n</i> =2517)	Girls ( <i>n</i> =2470)	<i>p</i> -value
13 years			
Not overweight <sup>a</sup>	697 (83)	740 (89)	0.002 <sup>b</sup>
Overweight <sup>a</sup>	115 (14)	76 (9)	
Obesity <sup>a</sup>	25 (3)	13 (2)	
BMI	19.5 (19.3–19.7)	19.0 (18.8–19.2)	<0.001 <sup>c</sup>
Weight	52.5 (51.8–53.1)	49.5 (48.9–50.2)	
Height	163.5 (162.9–164.1)	161.2 (160.7–161.6)	
14 years			
Not overweight <sup>a</sup>	638 (77)	699 (89)	<0.001 <sup>b</sup>
Overweight <sup>a</sup>	163 (20)	75 (10)	
Obesity <sup>a</sup>	28 (3)	11 (1)	
BMI	20.8 (20.6–21.0)	19.8 (19.6–20.0)	<0.001 <sup>c</sup>
Weight	60.6 (59.8–61.4)	53.6 (52.9–54.3)	
Height	170.4 (169.8–171.1)	164.4 (163.9–164.8)	
15 years			
Not overweight <sup>a</sup>	674 (79)	763 (89)	<0.001 <sup>b</sup>
Overweight <sup>a</sup>	145 (17)	72 (8)	
Obesity <sup>a</sup>	32 (4)	21 (3)	
BMI	21.2 (21.0–21.5)	20.7 (20.5–20.9)	<0.001 <sup>a</sup>
Weight	65.4 (64.6–66.1)	57.0 (56.4–57.7)	
Height	175.4 (174.8–175.9)	165.8 (165.4–166.3)	
all ages			
Not overweight	2009 (80)	2202 (89)	<0.001 <sup>a</sup>
Overweight and obesity	508 (20)	268 (11)	

Values are *n* (%) or mean (95% CI). <sup>a</sup>Not overweight includes both normal weight and underweight (ISO BMI <25 kg/m<sup>2</sup>); overweight (ISO BMI 25.0–29.99 kg/m<sup>2</sup>), and obesity (ISO BMI ≥30.0 kg/m<sup>2</sup>), using International Obesity Task Force, based on self-reported weights and heights. <sup>b</sup>Pearson chi-squared test. <sup>c</sup>Student *t*-test.

#### *Associations between overweight/obesity, demography, self-rated health, and lifestyle*

No associations were found between overweight/obesity and self-rated health when adjusting for different lifestyle indicators. An association was found between overweight/obesity and age for boys: 14-year-old boys were more overweight than

13-year-old boys (Table IV). Overweight/obese boys and girls were more often physically inactive. Living with one parent or watching TV ≥3 hours per day were associated with overweight/obesity for girls. Skipping breakfast, not brushing teeth twice a day, and using snuff were associated with overweight/obesity for boys (Table IV). Further details are found in Table IV.

Table III. Lifestyle among adolescents aged 13–15 in Västerbotten, Sweden.

Lifestyle	Boys ( <i>n</i> =2517)	Girls ( <i>n</i> =2470)	<i>p</i> -value <sup>a</sup>
Dietary habits			
Breakfast			
≥4 times/week	2129 (85)	1975 (80)	<0.001
≤3 times/week	388 (15)	495 (20)	
Fruits			
≥1 time/day	1094 (44)	1233 (50)	<0.001
3–6 times/week	638 (25)	692 (28)	
≤2 times/week	785 (31)	545 (22)	
Vegetables			
≥1 time/day	1180 (47)	1406 (57)	<0.001
3–6 times/week	649 (26)	664 (27)	
≤2 times/week	688 (27)	400 (16)	
Sweets			
<1 time/day	2170 (86)	2234 (90)	<0.001
≥1 time/day	347 (14)	236 (10)	
Snacks			
<1 time/day	2323 (92)	2388 (97)	<0.001
≥1 time/day	194 (8)	82 (3)	
Other lifestyle			
Tooth brushing			
≥2 times/day	1975 (78)	2119 (86)	<0.001
<2 times/day	542 (22)	351 (14)	
Sleep duration			
≥9 h/night	635 (25)	512 (21)	<0.001
<9 h/night	1882 (75)	1958 (79)	
TV watching			
<3 h/day	1835 (73)	1780 (72)	0.507
≥3 h/day	682 (27)	690 (28)	
Physical activity			
≥3 times/week	1110 (44)	908 (37)	<0.001
1–2 times/week	511 (20)	770 (31)	
<1 time/week	896 (36)	792 (32)	
Tobacco, alcohol, and drug use			
Smoking			
No	2187 (87)	2084 (84)	0.011
Yes <sup>b</sup>	330 (13)	386 (16)	
Snuff use			
No	1298 (52)	1296 (52)	0.525
Yes <sup>b</sup>	1219 (48)	1174 (48)	
Alcohol use			
No	1298 (52)	1296 (52)	0.525
Yes <sup>c</sup>	1219 (48)	1174 (48)	
Drug use			
No	2416 (96)	2396 (97)	0.051
Yes <sup>c</sup>	101 (4)	74 (3)	

Values are *n* (%). <sup>a</sup>Pearson chi-squared test. <sup>b</sup>Very seldom to every day. <sup>c</sup>Tried once or more often.

## Discussion

Our main findings were that overweight/obesity was more prevalent among boys (20%) than girls (11%) and boys reported good health to a higher extent (91%) than the girls (81%). No associations were found between overweight/obesity and self-rated health when adjusting for different lifestyle indicators. In addition, consistent with several other studies, single parenthood, skipping breakfast, insufficient tooth brushing, long hours of TV watching, and physical

inactivity were all associated with overweight/obesity [16–19].

A n advantage of the study was that a majority of the adolescents in Västerbotten County were involved and these participants had varying living conditions with respect to urban and rural as well as inland and coastal. As the response rate was high (82%), our findings are representative for adolescents in this part of Sweden. A limitation of the study was that few of the adolescents were born outside of Sweden (less than 5%), which limits the generalisability of the

Table IV. Demographic characteristics, self-rated health, and lifestyle associated with overweight and obesity (ISO BMI  $\geq 25$  kg/m<sup>2</sup>) among adolescents aged 13–15 in Västerbotten, Sweden.

Characteristic	Simple logistic regression		Multiple logistic regression <sup>a</sup>	
	Boys ( <i>n</i> =2517)	Girls ( <i>n</i> =2470)	Boys ( <i>n</i> =2517)	Girls ( <i>n</i> =2470)
Age (years)				
13	1.0	1.0	1.0	
14	1.5 (1.2–1.9) 0.001	1.0 (0.7–1.4) 0.887	1.4 (1.1–1.8) 0.012	
15	1.3 (1.0–1.7) 0.032	1.0 (0.7–1.4) 0.932	1.1 (0.8–1.4) 0.520	
Country of birth				
Sweden	1.0	1.0		
Other countries	1.3 (0.8–2.1) 0.280	1.3 (0.7–2.5) 0.449		
Parental status				
Two adults	1.0	1.0		1.0
One adult	1.1 (0.9–1.4) 0.238	1.4 (1.1–1.9) 0.009		1.4 (1.0–2.0) 0.026
Self-rated health				
Good	1.0	1.0	1.0	1.0
Fair	1.4 (0.9–2.0) 0.056	1.1 (0.8–1.6) 0.467	1.1 (0.8–1.6) 0.583	0.9 (0.6–1.3) 0.588
Bad	1.5 (0.8–2.7) 0.222	1.6 (1.0–2.7) 0.050	0.9 (0.5–1.8) 0.870	1.2 (0.7–2.1) 0.440
Breakfast				
$\geq 4$ times/week	1.0	1.0	1.0	1.0
$\leq 3$ times/week	1.7 (1.4–2.2) <0.001	1.6 (1.2–2.1) 0.002	1.4 (1.1–1.8) 0.016	1.3 (0.9–1.8) 0.085
Fruits				
$\geq 1$ time/day	1.0	1.0		
3–6 times/week	1.0 (0.8–1.3) 0.682	0.8 (0.6–1.1) 0.212		
$\leq 2$ times/week	1.1 (0.9–1.4) 0.478	0.8 (0.6–1.1) 0.193		
Vegetables				
$\geq 1$ time/day	1.0	1.0		
3–6 times/week	1.1 (0.9–1.4) 0.275	1.0 (0.7–1.3) 0.973		
$\leq 2$ times/week	1.0 (0.8–1.3) 0.920	0.8 (0.6–1.2) 0.364		
Sweets				
<1 time/day	1.0	1.0		
$\geq 1$ time/day	1.1 (0.8–1.4) 0.568	0.7 (0.5–1.2) 0.219		
Snacks				
<1 time/day	1.0	1.0		
$\geq 1$ time/day	1.2 (0.9–1.7) 0.277	0.8 (0.3–1.7) 0.495		
Tooth brushing				
$\geq 2$ times/day	1.0	1.0	1.0	1.0
<2 times/day	1.9 (1.5–2.3) <0.001	1.4 (1.0–2.0) 0.044	1.6 (1.3–2.0) <0.001	1.1 (0.8–1.6) 0.549
Sleep duration				
$\geq 9$ h/night	1.0	1.0		
<9 h/night	1.2 (0.9–1.5) 0.133	0.9 (0.7–1.3) 0.696		
TV watching				
<3 h/day	1.0	1.0	1.0	1.0
$\geq 3$ h/day	1.3 (1.1–1.6) 0.009	1.8 (1.4–2.4) <0.001	1.2 (0.9–1.5) 0.152	1.7 (1.3–2.2) <0.001
Physical activity				
$\geq 3$ times/week	1.0	1.0	1.0	1.0
1–2 times/week	1.2 (0.9–1.5) 0.215	1.2 (0.9–1.7) 0.257	1.2 (0.9–1.5) 0.309	1.2 (0.8–1.7) 0.314
<1 time/week	1.6 (1.3–2.0) <0.001	2.1 (1.5–2.8) <0.001	1.4 (1.1–1.7) 0.006	1.8 (1.3–2.5) <0.001
Smoking				
No	1.0	1.0	1.0	
Yes <sup>b</sup>	1.9 (1.5–2.5) <0.001	0.9 (0.6–1.3) 0.608	1.2 (0.9–1.7) 0.285	
Snuff use				
No	1.0	1.0	1.0	
Yes <sup>b</sup>	2.3 (1.7–3.2) <0.001	1.3 (0.7–2.4) 0.475	1.6 (1.1–2.4) 0.032	
Alcohol use				
No	1.0	1.0	1.0	
Yes <sup>c</sup>	1.4 (1.2–1.7) <0.001	1.0 (0.8–1.3) 0.834	1.1 (0.9–1.4) 0.301	
Drug use				
No	1.0	1.0	1.0	
Yes <sup>c</sup>	1.9 (1.2–2.9) 0.004	0.8 (0.4–1.9) 0.696	1.0 (0.6–1.7) 0.951	

Values are odds ratio (95% CI) and *p*-value. <sup>a</sup>Restricted to variables with a significant level of 10% in the simple regression analyses. <sup>b</sup>Very seldom to every day. <sup>c</sup>Tried once or more often.



study, a relatively large number of participants results in rather precise estimates and makes detection of sex-specific prevalence possible. Sex stratification and adjusting for other variables using multiple logistic regression models was used to handle potential confounders. The nature of cross-sectional data does not allow conclusions about causes and effects as time is not considered: a longitudinal study design would be needed for this. However, our cross-sectional study design provides a valuable snapshot of the population's status with respect to self-reported health, BMI, and lifestyle.

All data in the present study were based on self-reports. Although it is one of the most common procedures for data collection, it is a limitation compared to direct measurements. The fact that BMI was based on self-reported weight and height could be a risk of over- and/or under-reporting. When we compare our findings with other national data on height and weight from school health records that used standard scales and stadiometer, our data seems reasonable [20,21].

Several studies have correlated not eating breakfast with being overweight or obese, assuming that overweight/obese children eat breakfast less frequently and have less healthy food choices and poorer nutrient intake than normal weight children, factors that may lead to excessive weight gain [22,23]. In our study, skipping breakfast was associated with overweight only among boys, even though boys were eating breakfast more frequently than girls. This inconsistency might be explained by girls' better dietary habits regarding intake of fruits, vegetables, sweets, and snacks (Table III). Research on the subject, however, remains open as the composition of breakfast also plays an important role in weight control. Therefore, it is recommended to encourage people to have a healthy breakfast rather than to consume breakfast more often [24].

The WHO concludes that the risk of weight gain and obesity will be increased by high intake of energy-dense foods (fat and/or sugar) [25]. However, we found no associations between sweets and snacks intake or fruits and vegetables intake and overweight/obesity, a finding that agrees with the WHO's cross-sectional survey on school-aged children's health behaviour [26].

When it comes to association between tooth brushing and overweight/obesity, there are some other lifestyle behaviours involved. For instance, tooth brushing frequency in adolescents seems to be positively associated with regular consumption of breakfast, bed-time, and wake-up time, but obesity is associated with irregular consumption of breakfast and short sleep duration [22]. Insufficient frequency of tooth brushing (<2 times/day) was significantly associated with overweight/obesity among boys but

not among girls. This difference could be the result of different health behaviours between the boys and girls in our study: girls have more health-enhancing behaviours compared to boys as they consume more fruits and vegetables, eat less snacks and sweets as well as brush their teeth more often (Table III).

Short sleep duration and development of obesity are positively and consistently associated with children and young adults [27]. However, we found no significant association between sleep duration and overweight/obesity. The validity of self-reported sleep duration has been questioned by Bauer and Blunden. They compared self-reported sleep and actigraphy, a more objective measure. They found differences between sleep duration and quality of sleep. Bedtime in self-reported answers was similar to data collected by actigraphs, but to a lower extent when it came to measures of the quality of sleep [28]. In addition, recall bias is likely as data collected from questions about bedtime and rising time might not be valid and might be affected by social desirability bias.

Many cross-sectional studies have reported an association between TV watching, playing video games, using computers, and obesity as these activities leads to a sedentary lifestyle. Spending more hours in front of a TV often means consuming more snacks and, consequently, obesity [29]. In our study, the association between overweight/obesity and more hours in front of TV was significant among boys and girls, but the association remained only for the girls in the multiple regression analysis. This potential sex-difference could be elucidated by distinguishing between activity levels in boys and girls: 44% of the boys and 37% of the girls participated in physical activity at clubs or sport centres at least three times per week (Table III). This difference in participation rate might explain why boys compensate sedentary habits with higher levels of physical activities. There is no doubt about the existing positive relationship between overweight/obesity and physical inactivity. This finding has been supported by numerous studies [11,12,16,18,22]. In our study, overweight/obesity was more prevalent among both boys and girls who were physically active less than once a week.

This study uncovered two alarming findings. Firstly, overweight/obesity as a serious public health problem found among one-fifth of the boys, and secondly, low self-rated health as a valid predictor of mortality and morbidity found among one-fifth of the girls. Girls living with a single parent and boys and girls with unhealthy lifestyles were more likely to be overweight, a part from approaching risk factors on an individual level, also structural changes on a societal level are needed for a positive long-term change. Therefore, our findings emphasise the need for developing and implementing effective health promotion

strategies for school-aged children both in individual and societal contexts. Particularly, schools can be considered as an excellent setting to provide health education and lifestyle intervention programmes to prevent overweight and increase wellbeing among children and adolescence. Finally, longitudinal studies would be helpful to investigate this topic further.

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