TITLE: Tracking patterns of body mass index and triceps skinfold thickness from childhood to young adulthood: a 12-year prospective cohort study in Slovenia

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ABSTRACT

OBJECTIVE: To examine tracking patterns of body mass index (BMI), triceps skinfold thickness (TSF), height and weight from childhood to young adulthood in a rapidly developing society.

DESIGN: Prospective 12-year cohort study of the Slovenian children, born during 1990-1991.

SUBJECTS: A subsample of 4 833 Slovenian children from the 1990-1991 national cohort (n = 21 777) who were included in the SLOFIT monitoring system from 1997 to 2008, with complete data at age 7 and 18 y.

MEASUREMENTS: Height, weight and TSF were measured at ages 7, 11, 14 and 18 y. The IOTF BMI cutoff points were used to identify overweight and obesity.

RESULTS: Height, weight, and BMI at age 18 y were well predicted from childhood and grew more predictable with age, while TSF was not. Obese and overweight children had the greatest risk of becoming overweight or obese young adults, since tracking of overweight and obesity showed that 53.9% of overweight and 77.7% of obese 7-y old males remained overweight or obese at age 18 y in comparison with 32.1% of overweight and 62% of obese 7-y old females. History of obese 18-y olds showed that 40% of males and 48.6% of females had been obese already at age 7 y.

CONCLUSION: The study confirmed the tracking of BMI from childhood to young adulthood. Overweight or obese Slovenian children are very likely to become overweight or obese adolescents and young adults, which calls for the need of early prevention and treatment of overweight and obesity.

KEY WORDS Child, young adult, body mass index, triceps skinfold thickness, obesity, tracking

INTRODUCTION

In the last decades overweight and obesity became acknowledged as one of the fastest growing nontransmissible health problems worldwide.[1] An increase of the prevalence of overweight and obesity is a particular concern since it proves to be an important factor for numerous chronic diseases and other health disorders among adults [2–8] as well as among children.[9–14] Consequently, obesity does not only worsen the quality of life of affected individuals but also increases public and personal health expenditures.[15–19] Obesity is a burdening factor in all respects, it should become a public health priority in the developed and developing countries and it is from this perspective of prevention that the relation between childhood obesity and young adult obesity has been investigated. Several studies showed a tendency of those who are overweight or obese as children to remain overweight or obese as adolescents and adults.[20–28] Although the evidence is extensive, not many studies have been based on large and unselected population samples or have used other predictors than height and weight. Furthermore, much of the research has been conducted in high-income and predominantly western countries while very limited data is available for middle- or low-income countries and post-socialist countries (like Slovenia), which quickly and abruptly adopted the capitalist economy and consumerist lifestyles, including eating habits and physical activity patterns. Longitudinal research on these topics from rapidly changing societies might provide new insights, enable comparison and consequent prediction of obesity trends among children and adults in these societies.

This study focused on tracking of height, weight, triceps skinfold thickness (TSF) and body mass index (BMI) from childhood to young adulthood among the Slovenian schoolchildren who entered primary school in the school year 1996/97 and turned 18 y of age in the school year 2007/08. We used longitudinal data to investigate relations among all four measures at ages 7, 11, 14 and 18 y to asses: 1) associations between the height of children and young

adults, 2) the extent to which obese children become obese young adults, 3) whether obese young adults were obese children, and 4) BMI groupings match of the TSF groupings of normal, obese, and overweight. Apart from the first year of life, two critical periods in childhood for the development of obesity have been identified in the literature;[27, 29–34] the period of adiposity rebound between age 5 and 7 y and of adolescence. This is why our analysis used the measurements at age 7, 11, and 14 y to analyse the overweight and obesity outcome at 18y.

METHODS

Subjects

The 1988/90 Slovenian cohort includes children born between September 1988 and April 1990. From a target population of 23 114 children who were enrolled in the first grade of the Slovenian primary schools in the school year 1996/97, information on weight and height in the last year of the secondary school at average age 18.7 ± 0.3 y was obtained on 4 833 (20.9%) children in April 2008. The nationally representative population sample included 21 777 children (94.2% of the entire generation) enrolled in the SLOFIT monitoring system of physical and motor development of children and youth.[35] Children, who have been enrolled in the SLOFIT system by the positive written consent of their parents, have been measured every school year between 15 and 30 April throughout their 11-year schooling period. The analysed subsample included only children whose information on body weight and body height was obtained both in the first grade of primary school and the last year of the 4-year secondary school. Children with incomplete information in the 1997 or 2008 measurements were excluded from the subsample. The subsample also did not include pupils who were enrolled in the 3-year vocational schools and therefore finished their schooling a year earlier in 2007 not reaching age 18 y at that time. Additional drop of the sample at the end of the schooling

occurred because many pupils refused to participate in the measurements after they turned 18 and did not need the written consent of their parents any more. This study presents the data from the 1997 SLOFIT measurement and the 2001, 2004 and 2008 follow-ups. The age of the participating children was calculated to the closest month at the day of the measurements every year and the average age at the 1997 measurement was 92.8 ± 3.7 m for males and 92.7 ± 3.9 m for females. The differences in mean values and standard deviations of height, weight, TSF, and BMI among the population sample and the analysed subsample are presented in **Table 1**. Mean values and standard deviations of the population sample and the subsample were very similar, with differences in mean height below 5mm, differences in mean weight below 0.6kg (accept in 11 y females where the average weight of the population sample was 1.1kg larger), differences in mean TSF below 0.4mm, and differences in mean BMI below 0.4kg/m^2 at all ages.

Measurements

Heights, weights and TSF were measured by trained physical education teachers at 7, 11, 14 and 18 y ± 1 y. Subjects were weighted barefoot in their shorts and t-shirts to the nearest 0.5 kg by calibrated portable scales, height was measured with a stadiometer to the nearest 0.5 cm and triceps skinfold was measured with Holtain-Tanner calliper to the nearest mm. Data were checked to detect coding errors. BMI was calculated at each age. The IOTF cut off points [36] were used to define overweight and obese children. Age-specific values are given in **Table 2**.

Statistics

Partial correlation coefficients, adjusted for date of measurements, were calculated between height, weight, TSF and BMI at age 7, 11, 14, and 18. To reduce skewness of the weight, TSF and BMI distributions, correlations were also performed by using Lg(weight), Lg(TSF),

Lg(BMI) and Sqrt for all three variables. Differences between correlations using transformed and untransformed variables proved to be trivial (–0.26 to 0.24), so only correlations of untransformed variables are presented. BMI categories at age 7, 11, 14, and 18 were cross-classified. Percentages are shown primarily to show outcome for the obese children and to show the BMI distribution at age 7 for the different BMI groups at age 18. The IOTF-classified normal, overweight and obese BMI categories[36] were cross-classified with the TSF normal, overweight and obese categories[37] to establish how the first classification related to the latter. All analyses were performed using SPSS 15.0 for Windows (SPSS Inc., Chicago, IL).

RESULTS

Mean (± SD) heights, weights, triceps skinfold and BMIs for subjects 7 to 18 y for males and females are shown in **Table 3**.

Height

Correlations between height at 7 and 18 y in **Table 4** tended to be strong for males ($r = 0.69$) and females ($r = 0.65$). A expected, correlations were greater over shorter intervals. Males had higher correlations than females at ages 7 and 11 y, but lower correlations at age 14. These sex differences reflect the differences in the pubertal growth spurt, which occurs later for males. At age 14 the growth period of females is nearing the end and the difference between average height of females at ages 14 and 18 y, visible in **Table 3,** was only 2cm, while the difference between the average height of males in the same period was four times bigger at 8cm. The concluded growth of females at age 14 y is visible also in Table 4 since the correlation between height at age 14 and 18 y among females was considerably stronger ($r = 0.91$) than among males ($r = 0.72$).

Weight and BMI

In general, correlations for weight were very similar to those of height (r = 0.64 for males and females between ages 7 and 18 y). As in height, stronger associations were observed over the shorter periods in both sexes (**Table 4**). As in height, the correlations in weight among shorter periods were slightly stronger among males than among females. Correlations between BMI at different ages were weaker than for weight and height (r = 0.58 for males and r = 0.59 for females between ages 7 and 18 y) and the correlations among shorter periods were, again, slightly stronger for males than for females. The correlations indicated (BMI^2*100) that BMI at 11 or 14 y explained 49–69% of the variability in BMI at age 18, while BMI at 7 y explained only around 34% of the variability in BMI at age 18 for males and females.

Triceps skinfold fat

In comparison to all other measures, the TSF showed the weakest correlations (**Table 4**) between ages 7 and 33 y (r = 0.39 for males and r = 0.35 for females). Stronger correlations were, again, observable among males and over the short term. The strongest correlations in TSF were observable between ages 11 and 16 y and were slightly higher among males (r = 0.70) than among females (r = 0.62). The correlations indicated that only 12–25% of the variability in TSF at age 18 y was explained by TSF at 7, 11, or 14 y. Correlations of TSF with height, weight, and BMI (**Table 5**) suggested that TSF correlates best with BMI and that correlations are largest at age 11 y in males (r = 0.77) and females (r = 0.70). High correlations were observed also between TSF and weight at all ages in both sexes, while correlations of TSF with height proved to be small (r < 0.29). Comparison of groupings according to TSF percentile groups[37] and IOTF BMI groups[36] in **Table 6** showed, that both groupings overleaped in the grouping of normal BMI group with 50th percentile TSF group,

while the matching of the overweight BMI group with 85th percentile TSF group, and of the obese BMI group with 95th TSF percentile group was rather incoherent.

BMI outcome for obese and overweight children

The data in **Table 7** shows whether overweight and obese 7-y olds become overweight 18-y olds, giving the percentage of children, who were subsequently in each BMI group according to IOTF cutoff points at age 18 y. The general trend was that the higher the BMI group the higher the probability of being obese at age 18 y. For example, 17.3% of 7-y old males with normal weight were obese or overweight at age 18 y compared with 57.1% who were overweight or 77.7 who were obese at age 7 y. The chances of an obese 7-y old becoming an obese 18-y old increased consistently with age. For the obese males at 7 y the percentage of those, who were obese at 18 y increased from 19.8% at age 7 y to 26.4 at age 11 y and 33.8 at age 14 y. The trends among females were similar with 17% of obese 18-y olds at age 7 y, 32.7% at age 11 y, and 37.1% at age 14 y.

Previous BMI of obese 18-y olds

The data in **Table 8** presents percentages for BMI groups of those 18 y who had been in different BMI groups in childhood and adolescence in order to assess whether obese 18-y olds were obese as children. At every age the majority (around 90%) of 18-y olds with normal weight would be identified as children with normal weight. In contrast, between 41.3 and 57.6% of overweight 18-y old males, and between 53.2 and 63.4% of overweight or obese females would be identified as overweight children. In both sexes there was a very high percentage of obese at 18 y who would have been identified as overweight or obese at earlier ages. The percentage grew with age in both sexes; among males 73.3% of obese 18-y olds were overweight or obese at age 7 y, 93.9% at age 11 y and 100% at age 14 y, while among

females 85.7% of obese 18-y olds were obese at age 7 y, 93.5% at age 14 y and 97.1% at age 14 y.

DISCUSSION

It has already been established that tracking childhood obesity beyond early adult age is a serious limitation of the literature to date[36, 38] but the lack of studies from the developing countries and the countries that experienced abrupt and big socio-political and economical changes in recent years seems to be equally limiting.[39] Although our study has a limitation of reaching only the school-going population, Slovenia is a country which experienced enormous socio-political and economical changes in the last 20 years that strongly influenced the lifestyles, nutritional habits of children and youth, and their physical development.[40–47] Our study is the most recent cohort study including young adults who turned 18 y in 2008 and were born at the beginning of the socio-political and economical transition of Slovenia in early 1990s.

Studies in the United States and Europe that tracked obesity from childhood to adulthood generally found that about one-third of overweight and obese children remained overweight and obese as adults, but the rate varies because of differences in how obesity is defined, the length of follow-up, and children's initial age.[24, 38, 48–52] In our cohort study, the percentage of overweight and obese 7-y olds who became overweight or obese 18-y olds was considerably higher (over 65% among males and below 50% among females). Our findings, which are more alerting, might be the outcome of the recent cohort since most of the studies used the cohorts from the 1950s and 1960s. This means that young adults, included in our cohort, lived in a very different environment as children than the ones in the older cohorts, especially regarding the abundance of fat- and sugar-rich food, availability of media and information technology, and the growingly sedentary lifestyles.

In addition, we found that overweight and obesity tracks slightly more consistently in females than it does in males since obese and overweight females were more likely to remain in the same BMI group over time or move to a lower BMI group (obese to overweight and overweight to normal, respectfully). The reason for this phenomenon remains unclear but it could be that body image and consequent weight management is more important for girls than for boys and they put more effort into maintaining or lowering their weight, while boys who much often moved from the lower to the higher BMI group, show much lower concern in this matter. Another possible reason that might explain this phenomenon is the use of the IOTF standard, which could misclassify some Slovenian children and adolescents because this standard was constructed on the data from other countries than Slovenia.

In comparison to some other studies,[25, 38, 48] BMI in our population is well predicted from childhood. This is suggested by large correlations (above $r = 0.50$) between childhood and young adulthood BMI and a large proportion of obese and overweight 18-y olds identified from childhood. According to the IOTF cutoff points for obesity, 40% of Slovenian 18-y old obese males and 48.6% females would have been identified from their BMI at age 7 y. The percentage identified increased with years and it is notable that at age 14 y a large majority of the obese 18-y olds had already been obese. The data suggests that children who today enter secondary schools obese are almost certain to remain so at the end of their schooling. Although Serdula et al[38] estimated that less than a half of adult obesity can be attributed to childhood obesity, and our data supports this finding, it should be noted that taking into account overweight and obese BMI groups combined, over 73% of males and over 85% of 18-y old obese females would have been classified as overweight or obese already at age 7 y, and the percentage identified would have increased to over 90% with age in both sexes. Also the correlations of BMI at age 18 y with BMI at earlier ages suggest that between one third (at

age 7 y) and two thirds (at age 14 y) of the variability in BMI at age 18 y was explained by BMI in childhood.

In comparison with correlations between BMI from childhood to young adulthood, correlations for height were even larger ($r = 0.69$ for males and $r = 0.65$ for females at age 7 y). As it has been confirmed in other studies,[25, 53] the observed correlations between female height at age 11 y and height at age 18 y were slightly lower than the ones in height between ages 7 and 18 y. This was expected since correlations around the time of maturation in females may be slightly poorer than for prepubertal measures.[53] Earlier maturation of females in comparison to males was observed in correlation between heights at age 14 y and at age 18 y with $r = 0.91$ for females and 0.72 for males. Similarly high correlations were found also among childhood and young adulthood weight.

Finally, in contrast with the large correlations of height, weight, and BMI between childhood and adulthood, those for TSF were only medium ($r < 0.50$), accept the correlation of TSF at age 11 and 14 y, when correlation was large among females ($r = 0.62$) and even larger among males ($r = 0.70$). This finding is conclusive with other findings which suggested that precision of obesity prediction by TSF is very low up to late childhood and becomes somewhat better in adolescence, and that correlations are usually higher for males.[22] Our data suggested that TSF was not well predicted from childhood and that although the BMI and TSF groupings did match well in the normal BMI group, they behaved much poorer in the obese, and especially in the overweight BMI group. This phenomenon could be attributed to the known methodological problems.[37] It has been reported previously that skinfold-thickness measurements in obese subjects have poor reliability,[54] and that skin thickness and skinfold compressibility vary by age, by site, and possibly also by sex.[55–58] This suggests that using TSF curves for classification of overweight and obese children should be used with all these

problems in mind and that use of BMI curves are more practical for tracking of obesity from childhood to adulthood.

Child to adult relations for obesity will continue to be of interest to researchers and policy makers, since in many countries policies to prevent childhood and adult obesity are being discussed.[59] The evidence presented here suggests that prevention of adulthood obesity should focus on identification and treatment of a high risk group in childhood and adolescence. As children and adolescents with normal weight are very likely to remain normal, and according to the evidence which suggests that environmental influences determine overweight and obesity among children in a much larger extent than genetics[60] it seems especially important to prevent and treat overweight and obesity already at young age On the other hand, the relative risk for becoming an obese adult is much increased for those who are already obese or overweight as children or adolescents. From an epidemiological viewpoint these are the critical periods when preventive measures such as nutrition and physical activity management could be applied.

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TABLE 1

Differences in mean values and standard deviations between the population sample and the analysed subsample

Age	7 y	11 y	14 y	18 y
Males				
Height (m)	0.000 [0.001][1]	0.002 [0.002]	0.000 [0.001]	0.000 [0.000]
Weight (kg)	0.060 [0.154]	0.591 [0.474]	0.403 [0.155]	-0.058 [0.085]
TSF (mm)	0.002 [0.078]	0.252 [0.274]	0.223 [0.146]	0.134 [0.148]
BMI (kg/m^2)	0.022 [0.048]	0.200 [0.119]	0.147 [0.069]	-0.025 [0.035]
Females				
Height (m)	0.002 [0.000]	0.006 [0.001]	0.001 [0.002]	0.000 [0.000]
Weight (kg)	0.345 [0.311]	1.140 [0.573]	0.770 [0.777]	0.225 [0.208]
TSF (mm)	0.161 [0.125]	0.458 [0.461]	0.370 [0.217]	0.172 [0.143]
BMI (kg/m^2)	0.153 [0.143]	0.356 [0.263]	0.257 [0.273]	0.084 [0.087]

[1] SD differences in brackets

TABLE 2

Percentage of normal, overweight and obese children at age 7, 11, 14, and 18[1]

	Males			Females		
Age	Normal	Overweight	Obese	Normal	Overweight	Obese
7 y	81.1 [1712]	13.2 [279]	5.7 [121]	82.5 [1871]	13.1 [296]	4.4 [100]
11 y	76.8 [1471]	18.7 [358]	4.5 [87]	81.8 [1686]	15.9 [327]	2.4 [49]
14 y	78.7 [1663]	17.6 [372]	3.6 [77]	87.2 [1977]	11.2 [255]	1.5 [35]
18 y	74.5 [1573]	22.7[479]	2.8 [60]	87.4 [1982]	11.0 [250]	1.5 [35]

[1] *n* in brackets

TABLE 3

Mean height, weight, triceps skinfold thickness and BMI at ages 7–18 y

	Height	Weight	TSF	BMI
	m	*kg*	*mm*	*kg/m²*
		Males		
7 y (n = 2112)	1.29 ± 0.05	28.01 ± 5.30	9.76 ± 4.22	16.62 ± 2.35
11 y (n = 1917)	1.51 ± 0.07	43.54 ± 9.77	12.63 ± 6.10	18.93 ± 3.30
14 y (n = 2112)	1.72 ± 0.08	62.04 ± 11.70	10.88 ± 5.84	20.86 ± 3.18
18 y (n = 2112)	1.80 ± 0.06	75.64 ± 11.13	10.74 ± 5.49	23.27 ± 3.06
		Females		
7 y (n = 2267)	1.28 ± 0.06	27.04 ± 5.03	10.98 ± 4.15	16.34 ± 2.27
11 y (n = 2065)	1.52 ± 0.07	43.33 ± 9.57	12.85 ± 5.61	18.63 ± 3.18
14 y (n = 2267)	1.65 ± 0.06	55.72 ± 8.66	14.17 ± 5.25	20.56 ± 2.81
18 y (n = 2267)	1.67 ± 0.06	60.59 ± 9.08	15.54 ± 5.33	21.81 ± 2.89

TABLE 4

Partial correlation matrix of height, weight, TSF and BMI at ages 7–18 y[1]

	Males				Females			
	7 y	11 y	14 y	18 y	7 y	11 y	14 y	18 y
Height								
7 y	1.00 [2112]	0.87 [1917]	0.78 [2112]	0.69 [2112]	1.00 [2267]	0.84 [2065]	0.74 [2267]	0.65 [2267]
11 y		1.00 [1917]	0.86 [1917]	0.70 [1917]		1.00 [2065]	0.74 [2065]	0.60 [2065]
14 y			1.00 [2112]	0.72 [2112]			1.00 [2267]	0.91 [2267]
18 y				1.00 [2112]				1.00 [2267]
Weight								
7 y	1.00 [2112]	0.86 [1917]	0.78 [2112]	0.64 [2112]	1.00 [2267]	0.85 [2065]	0.73 [2267]	0.64 [2267]
11 y		1.00 [1917]	0.87 [1917]	0.72 [1917]		1.00 [2065]	0.83 [2065]	0.68 [2065]
14 y			1.00 [2112]	0.78 [2112]			1.00 [2267]	0.82 [2267]
18 y				1.00 [2112]				1.00 [2267]
TSF								
7 y	1.00 [2071]	0.66 [1882]	0.52 [2071]	0.39 [2071]	1.00 [2222]	0.62 [2029]	0.49 [2222]	0.35 [2219]
11 y		1.00 [1917]	0.70 [1917]	0.49 [1917]		1.00 [2065]	0.62 [2065]	0.45 [2064]
14 y			1.00 [2112]	0.50 [2112]			1.00 [2267]	0.49 [2264]
18 y				1.00 [2112]				1.00 [2264]
BMI								
7 y	1.00 [2112]	0.80 [1917]	0.71 [2112]	0.58 [2112]	1.00 [2267]	0.78 [2065]	0.66 [2267]	0.59 [2267]
11 y		1.00 [1917]	0.84 [1917]	0.70 [1917]		1.00 [2065]	0.82 [2065]	0.70 [2065]
14 y			1.00 [2112]	0.78 [2112]			1.00 [2267]	0.79 [2267]
18 y				1.00 [2112]				1.00 [2267]

[1] *n* in brackets

TABLE 5

Partial correlation matrix of TSF with height, weight, and BMI at ages 7–18 y[1]

	Males			Females		
TSF at age	Height	Weight	BMI	Height	Weight	BMI
7 y	0.26 [2071]	0.66 [2071]	0.70 [2071]	0.26 [2222]	0.61 [2222]	0.64 [2222]
11 y	0.25 [1917]	0.71 [1917]	0.77 [1917]	0.16 [2065]	0.61 [2065]	0.70 [2065]
14 y	0.01 [2112]	0.56 [2112]	0.68 [2112]	0.05 [2267]	0.58 [2267]	0.63 [2267]
18 y	0.05 [2112]	0.56 [2112]	0.60 [2112]	0.04 [2264]	0.56 [2264]	0.62 [2264]

[1] *n* in brackets

TABLE 6

Comparison of BMI and TSF grouping

	Males			Females		
TSF percentile groups[1]	50th	85th	95th	50th	85th	95th
BMI group						
Normal	93.2	5.8	1.0	93.8	5.5	0.7
Overweight	39.6	30.8	29.7	54.9	25.2	19.9
Obese	12.7	18.6	68.6	19.4	30.6	50.0

[1] TSF 50th, 85th, and 95th percentiles correspond to normal, overweight, and obese TSF groups

TABLE 7

BMI outcome at age 18 for the normal, overweight and obese 7-, 11-, and 14-year olds[1]

	Males at age 18 y				Females at age 18 y			
BMI group	Normal	Overweight	Obese	Total (n)	Normal	Overweight	Obese	Total (n)
Age 7 y	[1573]	[479]	[60]		[1982]	[250]	[35]	
Normal	82.7	16.4	0.9	100.0 [1712]	93.5	6.3	0.3	100.0 [1871]
Overweight	47	45.9	7.2	100.0 [279]	65.9	29.7	4.4	100.0 [296]
Obese	22.3	57.9	19.8	100.0 [121]	38	45	17	100.0 [100.0]
Age 11 y	[1441]	[426]	[49]		[1807]	[224]	[31]	
Normal	86.5	13.3	0.2	100.0 [1471]	95	4.9	0.1	100.0 [1686]
Overweight	43	50.6	6.4	100.0 [358]	59.9	36.1	4	100.0 [327]
Obese	16.1	57.5	26.4	100.0 [87]	18.4	49	32.7	100.0 [49]
Age 14 y	[1573]	[479]	[60]		[1982]	[250]	[35]	
Normal	87.8	12.2	0.0	100.0 [1663]	95.1	4.8	0.1	100.0 [1977]
Overweight	28.0	62.9	9.1	100.0 [372]	38.4	53.3	8.2	100.0 [255]
Obese	11.7	54.5	33.8	100.0 [77]	8.6	54.3	37.1	100.0 [35]

[1] *n* in brackets

TABLE 8

Percentages within BMI groups at earlier ages according to BMI status at age 33 y

	Males at age 18			Females at age 18		
BMI group[1]	Normal	Overweight	Obese	Normal	Overweight	Obese
			%			
Age 7 y	[1573][2]	[479]	[60]	[1982]	[250]	[35]
Normal	90.0	58.7	26.7	88.2	46.8	14.3
Overweight	10.0	41.3	73.3	11.8	53.2	85.7
Obese	1.7	14.6	40.0	1.9	18.0	48.6
Age 11 y	[1441]	[426]	[49]	[1807]	[224]	[31]
Normal	88.3	45.8	6.1	88.7	36.6	6.5
Overweight	11.7	54.2	93.9	11.3	63.4	93.5
Obese	1.0	11.7	46.9	0.5	10.7	51.6
Age 14 y	[1573]	[479]	[60]	[1982]	[250]	[35]
Normal	92.8	42.4	0.0	94.9	38.0	2.9
Overweight	7.2	57.6	100.0	5.1	62.0	97.1
Obese	0.6	8.8	43.3	0.2	7.6	37.1

[1] BMI groups are not mutually exclussive, ie, Overweight includes also Obesity
[2] *n* in brackets