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THE PREVALENCE OF OVERWEIGHT AND OBESITY IN HUNGARIAN CHILDREN

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Introduction

Overweight and obesity are defined as abnormal fat accumulation. While in the developing countries people suffer from starvation, in the developed countries the obesity is one of the most frequent nutritional disorders (Bodzsár, 2003). In developed countries there are several studies which concordantly show increasing rates of overweight and obesity. This noncommunicable disease is the most frequent civilization disease according to World Health Organization surveys (WHO, 2006).

The prevalence of overweight and obesity increased 10-50% within the past decade throughout Europe (Jain, 2004). Obesity levels have risen sharply in Australia, Canada and Europe, for example between 1980 and 1990 in England the prevalence of obesity doubled to 16% and continues to increase (World Heart Federation, 2003).

Childhood obesity is a growing problem around the world. Childhood obesity increases the risk of obesity in adulthood, but it is unknown how parental obesity affects the chances of a child's becoming an obese adult. The 1-2 years old obese children without obese parent have 8 percent chance of the adulthood obesity, while those at the age of 10-to14 with at least one obese parent have 79 percent. (Whitaker, 1997; Wolfe, 1994).

Obesity is a major risk factor for various diseases in adulthood, for example cardiovascular diseases, diabetes mellitus, hypertension, stroke and different forms of cancer (WHO, 2000).

Not only genetic but environmental factors, as well as parental effects contribute to the development of obesity (Bodzsár, 2003; Mazura, 2002).

The population's state of health in Hungarian is among the worst in Europe. Among Hungarian adults who suffer from chronic diseases, the prevalence of obesity is about 40 percent, while 55 percent of the inhabitants of Hungary can be labelled as overweight or obese (Bíró, 1994).

The aim of this study is to examine the prevalence of overweight and obesity in sample Hungarian children aged 3-18 years. Though the BMI is the most common method for establishing the nutritional status according to WHO, a lot of studies use other methods like various skinfolds and waist circumference, which estimate the central fatness (McCarthy, 2003). In this study I examine whether there are significant differences between the overweight and obesity categories according to BMI and the waist circumference as well as the three skinfolds in trunk, which estimate also the nutritional status.

Subjects and methods

The sample of the 2nd Hungarian National Growth Study (Bodzsár et al. 2003-2006) discussed in this paper is representative of the Hungarian children aged 3-18 years (Table 1). The sample (n_{boys}=11796, n_{girls}=11458) was taken from nursery schools, primary schools, as well as from different types of secondary schools and vocational training schools.

The anthropometric measurements were taken according to the recommendation of IBP (Weiner, Lourie, 1969).

Table 1. Distribution of children by age and gender.

Age (Years)	Boys (n)	Girls (n)
3	127	149
4	582	553
5	712	664
6	730	716
7	726	734
8	837	889
9	867	862
10	823	838
11	840	896
12	849	902
13	778	808
14	718	692
15	920	821
16	950	795
17	865	677
18	472	462
Total	11796	11458

The prevalence of overweight and obesity was estimated by body mass index (BMI). Children were divided into BMI categories (normal nutritional status, overweight, obese) according to Cole's cut-off points (Table 2, Cole, 2000).

By waist circumference and three skinfolds I calculated the P50, P75, P90, P97 percentiles in the case of the whole sample. Than I calculated the 50^{th} percentiles by these four measurements for children who were divided overweight and obese according to Cole's BMI cut off points. On the diagrams these are called to 'BMI overweight' and 'BMI obese'.

The distribution of boys and girls frequencies among overweight and obesity were tested for homogeneity by chi square test. We used an alpha level of 5% for the analyses employing the SPSS for Windows Software.

Table 2. Cole's BMI cut-off points for overweight and obesity.

	Overweight(kg/m^2)		Obese (kg/m^2)	
Age (Years)	Boys	Girls	Boys	Girls
3	17.89	17.56	19.57	19.36
4	17.55	17.28	19.29	19.15
5	17.42	17.15	19.30	19.17
6	17.55	17.34	19.78	19.65
7	17.92	17.75	20.63	20.51
8	18.44	18.35	21.60	21.57
9	19.10	19.07	22.77	22.81
10	19.84	19.86	24.00	24.11
11	20.55	20.74	25.10	25.42
12	21.22	21.68	26.02	26.67
13	21.91	22.58	26.84	27.76
14	22.62	23.34	27.63	28.57
15	23.29	23.94	28.30	29.11
16	23.90	24.37	28.88	29.43
17	24.46	24.70	29.41	29.69
18	25.00	25.00	30.00	30.00

Results

1) Prevalence of overweight and obesity according to BMI

The frequency of overweight increases from age 3 to 10, thereafter the values decrease in girls. From age 12 the value of boys is significantly higher, than that of the girls one. The frequencies reach the maximum at the age of 14 (17.74%) in boys and at the age of 10 in girls (6.69%, Fig. 1, Table 3).

The prevalence of obesity increases from age 3 to 6 in boys, than we can observe stagnation between 6-11, and from age 12 to16 the values decrease. In the case of girls the frequency of obesity decreases after age 8. Between age 11-18 the value of the boys is significantly higher than that of the girls (Fig. 2, Table 3).

Table 3. The frequency of normal nutritional status and overweight and obese children.

	Boys			Girls		
Age (Years)	Normal (%)	Overweight (%)	Obese (%)	Normal (%)	Overweight (%)	Obese (%)
3	95.28	3.94	0.79	89.93	6.04	4.03
4	89.98	7.43	2.59	90.05	7.41	2.53
5	89.89	6.74	3.37	84.62	9.65	5.73
6	86.52	7.70	5.78	84.17	10.78	5.04
7	83.31	11.45	5.24	83.31	11.35	5.34
8	82.32	12.19	5.50	80.70	13.21	6.09
9	80.37	14.09	5.54	82.81	12.78	4.41
10	81.02	14.23	4.74	76.46	16.85	6.69
11	77.47	17.40	5.13	79.33	16.31	4.36
12	76.56	17.31	6.12	82.65	13.57	3.78
13	81.47	13.38	5.15	84.16	12.38	3.47
14	77.37	17.74	4.89	81.79	15.32	2.89
15	82.81	12.62	4.57	87.44	9.15	3.41
16	84.48	11.09	4.44	89.25	8.09	2.65
17	82.07	12.92	5.01	92.44	6.22	1.33
18	80.25	15.29	4.46	90.26	7.36	2.38

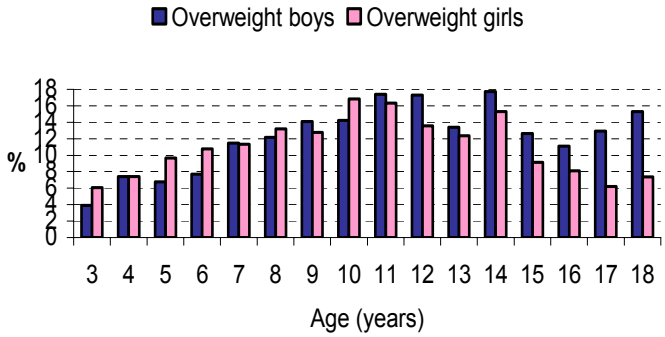

Figure 1: The prevalence of overweight children (χ^2 = 68.15, df=15).

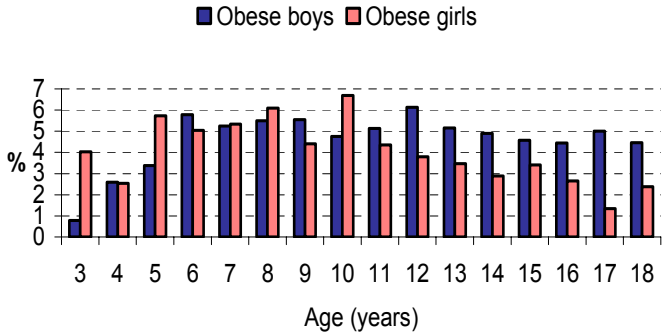

Figure 2: The prevalence of obese children (χ^2 = 46.32, df=15).

2) The percentiles of four measurements and the 50th percentile of 'BMI overweight' and 'BMI obese'
The next diagrams show the percentiles of the following measurements for the whole sample: waist circumference, chest skinfold, hip skinfold, and abdomen skinfold and show the 50th percentiles of these measurements of overweight and obese children according to BMI categories.

A) The percentiles of waist circumference and the 50th percentiles of overweight and obese children according to BMI
Figures 3-4 show that the 50th percentiles of overweight boys and girls fit the 90th percentile of the waist circumference of the whole sample, while the 50th percentile of obese children in both gender fit to the 97th percentile.

B) The percentiles of skinfolds and the 50th percentile of overweight and obese children according to BMI categories (Figs 5-10)
The results show that in all skinfolds the value of 50th percentile of overweight boys and girls lag behind of the 90th percentile that of the obese is around the 97th percentile.

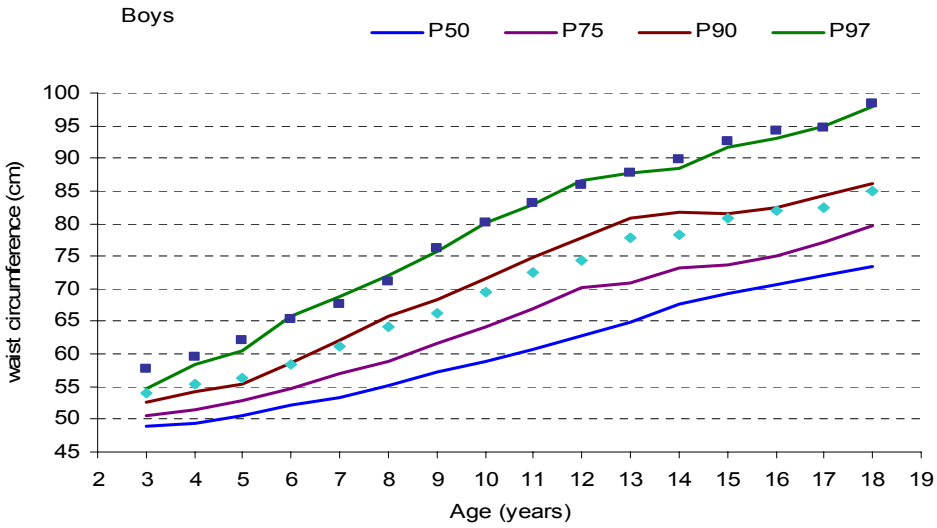

Figure 3: The percentiles of waist circumference of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese boys (⧉ 'BMI obese').

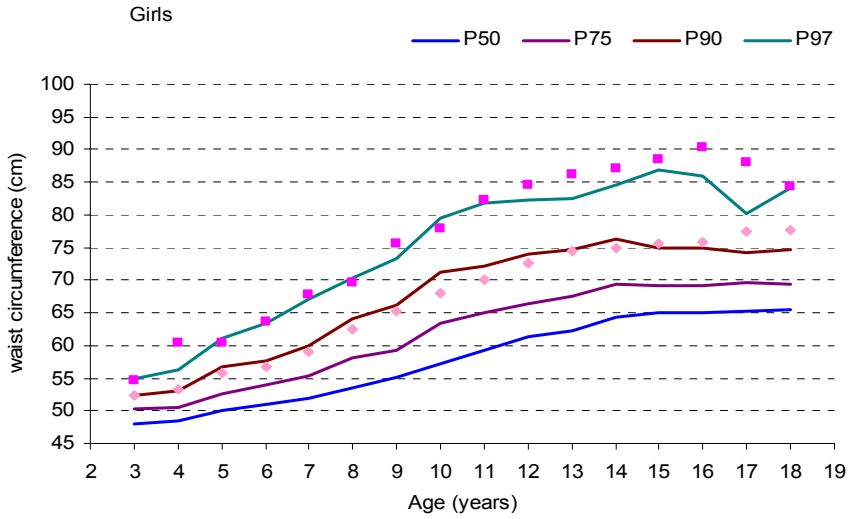

Figure 4: The percentiles of waist circumference of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese girls (⧈ 'BMI obese').

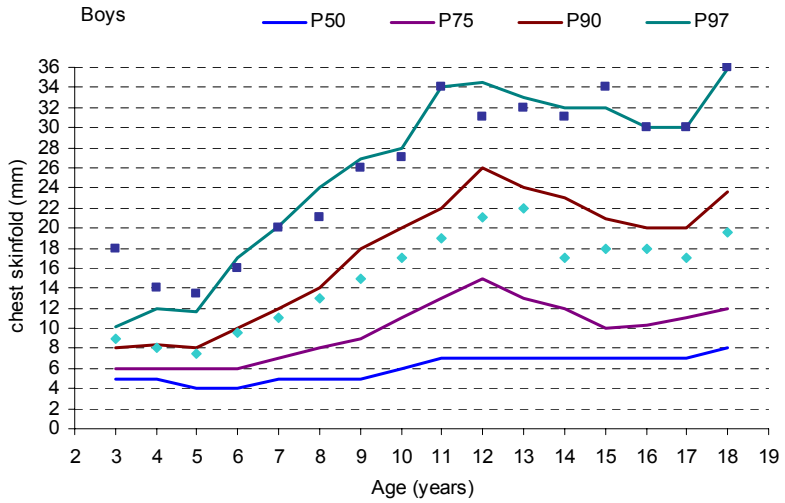

Figure 5: The percentiles of chest skinfold of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese boys (⧈ 'BMI obese').

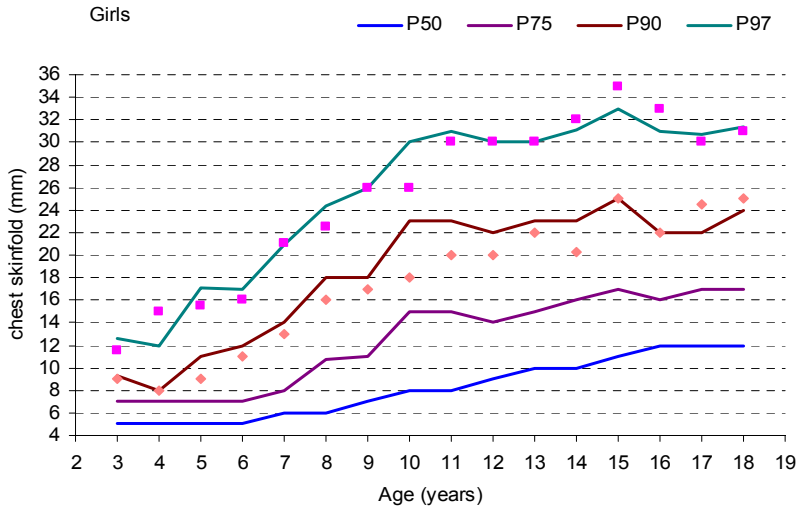

Figure 6: The percentiles of chest skinfold of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese girls (⧈ 'BMI obese').

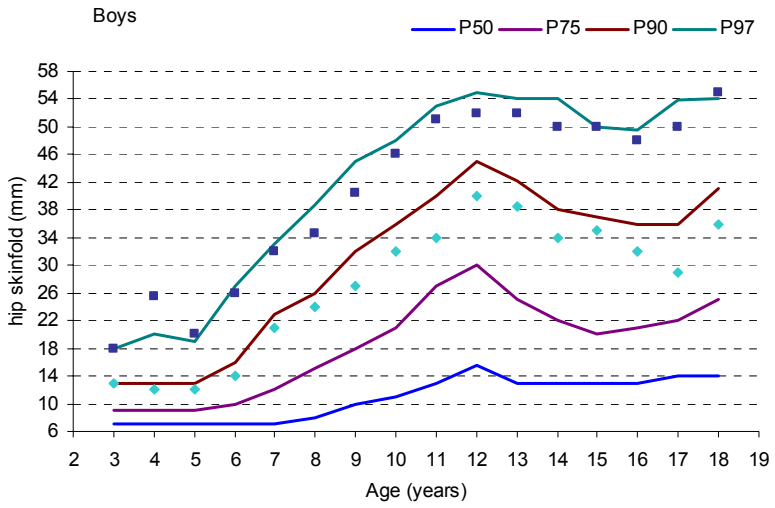

Figure 7: The percentiles of hip skinfold of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese boys (⧈ 'BMI obese').

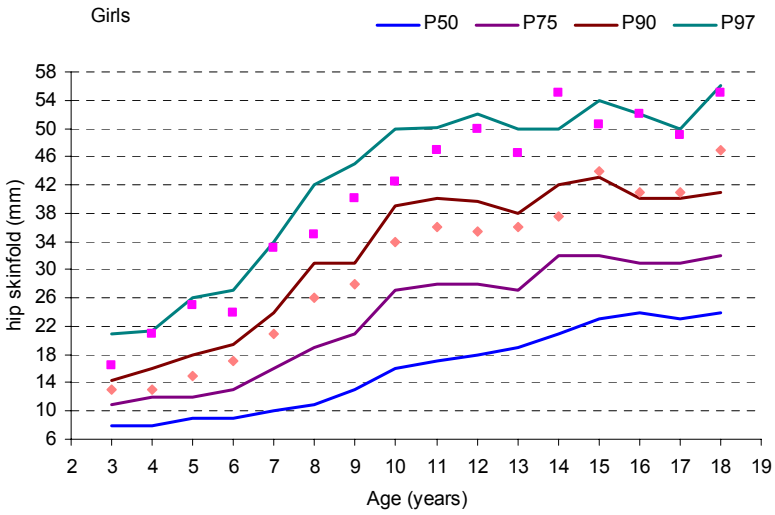

Figure 8: The percentiles of hip skinfold of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese girls (⧈ 'BMI obese').

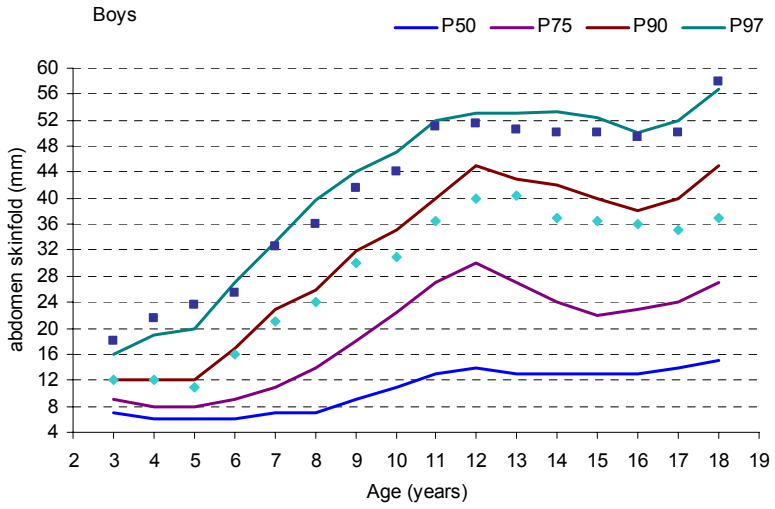

Figure 9: The percentiles of abdomen skinfold of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese boys (⧈ 'BMI obese').

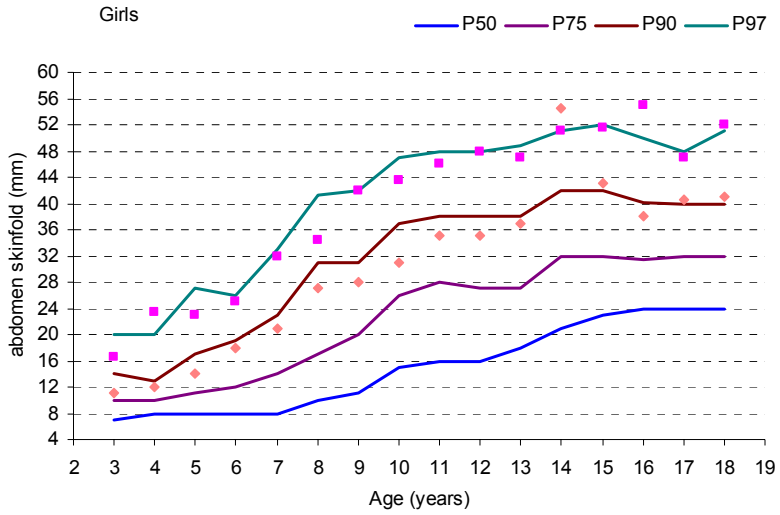

Figure 10: The percentiles of abdomen skinfold of the whole sample and the 50th percentile of overweight (◇ 'BMI overweight') and obese girls (⧉ 'BMI obese').

Discussion

In this study I examine that the 50th percentile of overweight and obesity according to BMI how relate to the percentile of different measurements.

The prevalence of the overweight and obesity increase from age 3 to 12 in boys, from age 3 to 10 in girls. The maximum value is 23% in both gender. Than in boys after a decline it increases again and reaches about 19%. Contrarily in girls the frequency of overweight and obesity decrease to about 10% by age 18. The cause of decreasing in puberty may come from the intensive growth, and the reserved fat is mobilized.

It would be stated that the prevalence of overweight and obese boys is higher in puberty and postpuberty then in girls. It might be explained by that the boys don't deal their body weight as much as the girls or the body weight control is not so important in boys. It seems that the body weight control begins early by girls.

The 50th percentile comparison examinations seem to prove that the very questionable BMI and Cole's cut-off points might estimate well the nutritional status.

While the BMI does not give information about the body composition (bones, fat, muscle compartments), namely by which body component the higher weight is caused and does not measure the fat distribution in the body, it is necessary to use more methods to divide individuals into overweight and obese categories.

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