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Weight-for-height of children in Iran

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Summary. Weight and height data were obtained from the 1990–1992 National Health Survey, a random cluster sample survey of 1 in 1000 families in Iran. Weight-for-height centiles of children and adolescents aged 2 to 18 in Tehran have been computed from relationships between weight for age and height for age Z-scores. The resulting centiles are compared to weight-for-height centiles based on BMI (weight/height^2) charts. Investigation of the data points age by age revealed that there are very few observations between the two sets of 3rd and 97th centiles, so that the normal range of BMI for age is effectively equivalent to the normal range of weight-for-height by age. Further analysis shows that BMI charts based on the subset of children living in urban Tehran may be reliably used for all children in Iran to determine the normal range of weight-for-height except for short children aged 2 to 5 for whom a table of the upper centiles is given.

1. Introduction

Weight and height both reflect the size of the individual. However weight by itself is a poor indicator of thinness or obesity. We need a measure which assesses the shape largely independent of size (Cole 1991). Weight-for-height is generally defined as a quantity which measures shape and is widely used in nutritional status assessment because shape is felt to be, in the broadest sense, indicative of body composition (Keys, Fidanza, Karvonen *et al.* 1972). The value of weight-for-height standards as a screening tool is particularly marked in two areas of public health, viz. protein-energy malnutrition and obesity (Cole 1979). Weight-for-height standards can be constructed directly from population weight and height data, or may be based on an appropriate index of obesity.

The American National Centre for Health Statistics (NCHS) growth reference included child weight-for-height charts, for the restricted age range from birth to 10 years in girls and to 11.5 years in boys (Hamill, Drizd, Johnson *et al.* 1979). A problem with these weight-for-height charts is that they fail to adjust for age in early life, for example, short toddlers are compared with tall infants, periods of life when the body fat content differs substantially (Cole, Freeman and Preece 1995). Furthermore, if the relationship between weight and height is age dependent, then unless data in each age group is extensive, the normal ranges of weight for relatively tall or short children in any age group will be based on very few observations.

To overcome this problem, Cole (1979) defined weight for age, w(a), as weight divided by a standard weight for age (the standard was median weight for age derived from tabulations by Tanner, Whitehouse and Takaishi (1966). Height for age, h(a), was similarly defined. The examination of four large data sets led Cole to recommend that an appropriate standard of weight-for-height could be defined in terms of $w(a)/h(a)^2$ for all pre-pubescent ages. However, Ayatollahi (1995) reported that Cole's approach was not appropriate to data on weights and heights of children

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aged 6 to 12 measured in a random sample survey in the Iranian city of Shiraz. Instead, Ayatollahi (1995) found that, if weight (log (weight)) and height Z-scores, ZWT and ZHT, were derived from the relationship of weight to age and height to age, then the regression relationship

$$\mathrm{ZWT} = 0.049 + 0.761 \times \mathrm{ZHT}$$

held true for all ages and both sexes. This enabled him to construct weight-for-height tables for children aged 6 to 12 based on all his data.

Several weight-for-height indices have been proposed as simple measures of fatness. An index of overweight is provided by the power function weight/height^p, where p (the power of height) usually takes values in the range 1 to 3. Cole *et al.* (1995) states that restricting it to whole numbers, the value for p which best adjusts weight-for-height, and at the same times removes most of the trend of increasing weight with age, is given by $p = 2$. This corresponds to the body mass index (BMI) weight/height^2, also known as the Quetelet index (1869) or the Kaup index (1921). However Ayatollahi (1995) showed that the normal ranges of weight-for-height derived from the Z-scores fitted his data well and were different from normal ranges of weight-for-height given by body mass index.

We have recently presented weight and height charts for children in Tehran (Hosseini, Carpenter and Mohammad 1998a) and have shown that they may also be used for all urban children in Iran and in modified form for rural children. The purpose of this paper is to present weight-for-height centiles comparable to our weight and height charts, to compare centiles of weight-for-height by age with centiles derived from BMI, and to examine how far the results generalize to the rest of Iran. Details of the BMI charts are described by Hosseini Carpenter and Mohammad (1999).

2. Material and methods

2.1. Subjects

Weights and heights measurements of children aged 2–18 years old in Iran were obtained in a National Health Survey of families in 1990–92. The survey was a random cluster sample survey of 1 in 1000 households throughout Iran. The sampling procedure is described by Hosseini Carpenter and Mohammad *et al.* (1999).

Outliers in the data on weight and height measurements were identified and removed as described by Hosseini Carpenter and Mohammad (1998b). Because of the differences between the growth data from the different provinces, data for 1599 boys and 1702 girls in urban Tehran were used as a representative subset of the total data (Hosseini Carpenter and Mohammad 1998c) to construct the growth and BMI charts for children aged 2–18 years for Iran. Here we usethe same subset of data to investigate the relationship of weight to height. We then use the total data to examine how far the findings extend to all children in Iran.

2.2. Methods

The weight for age and height for age charts for Iran were constructed in the same way as the BMI charts, described by Hosseini *et al.* (1999), using Healy's method (Healy, Rasbash and Yang 1988) as modified by Pan, Goldstein and Yang (1990). Raw centiles of the data were modelled using polynomials in age and Normal Z-scores. These models were used to calculate scores ZWT and ZHT for the data, which are approximately standard Normal deviates (Hosseini *et al.* 1998a). Here relationships between ZWT and ZHT have been modelled in STATA (1997) using regression methods combined with fractional polynomials (Royston and Altman 1994) as appropriate.

3. Results

3.1. *Estimation of age-related weight-for-height using Z-scores of weight and height*

The results of regressing ZWT on ZHT for each age–sex group are shown in table 1 and figures 1a and 1b. In only two of the 34 groups was the p-value for the quadratic coefficient < 0.05, and we concluded that the relationships were effectively linear. As expected, in almost all ages and for both sexes the intercepts are nearly zero. The regression slopes peak around puberty. In contrast the residual standard deviation (RSD) is higher at younger ages and drops between 5–14 year olds and rises in older ages again. In order to obtain a smooth relationship between the standardised indices of weight and height, the regression slopes (β) and the residual standard deviation (RSD) were modelled, combining the analyses of Z-scores for boys and girls.

The patterns of regression slopes and RSDs were modelled by means of an unweighted quadratic and cubic model in age respectively and the fitted values are shown in table 1 and in figures 1a and 1b. The models include a constant difference between the sexes. Sex $\times$ age and sex $\times$ age^2 interactions were not significant. It is worthwhile mentioning that alternative models for both slopes and RSDs by age were considered by looking at the second order fractional polynomials (Royston and Altman 1994). In both cases the quadratic and the cubic models were still found to be the most appropriate (lowest deviance). Weighted models give fitted values for slopes and RSDs within $\pm$ 2.8% and 1.4% of unweighted values.

From these structural relationships age-adjusted centiles of weight-for-height were derived by applying the estimated relationships of ZWT to ZHT at each age and then transforming the values back to weights and heights using the correspond-

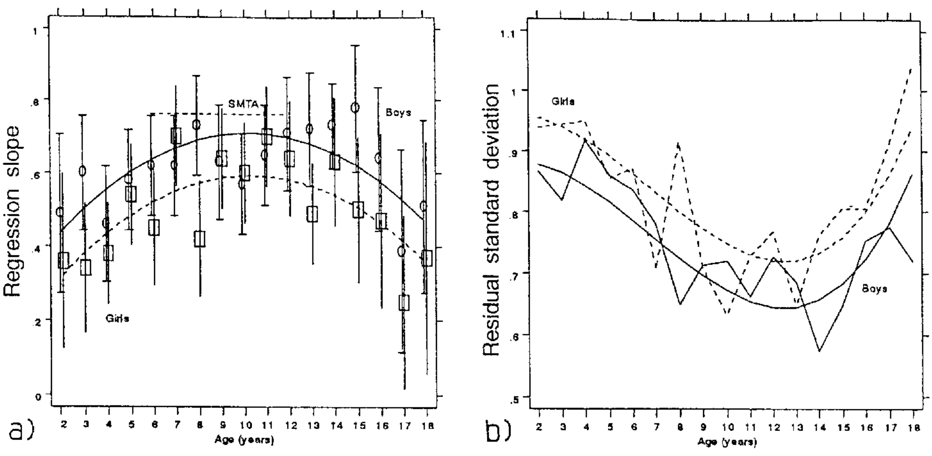

Figure 1. Age–sex regression slopes (confidence interval) of ZWT on ZHT, and the residual standard deviations together with the corresponding fitted values; —— for boys; - - - for girls. SMTA denotes Ayatollahi's (1995) fitted value for the regression slopes of ZWT on ZHT for Shiraz children aged 6–12 years.

Table 1. Linear regression parameters of log (weight) Z-scores (ZWT) on height Z-scores (ZHT), {ZWT = $\alpha + \beta \times$ ZHT} for urban Tehran children and their corresponding modelled values by sex and age.

Sex and age groups	n	α(SE)	β(SE)	RSD ZWT on ZHT	Modelled β	Modelled RSD
Boys						
2+	87	– 0.08(0.09)	0.49(0.11)*	0.866	0.437	0.877
3+	109	– 0.01(0.08)	0.60(0.08)	0.819	0.499	0.864
4+	117	0.14(0.09)	0.46(0.08)	0.917	0.552	0.843
5+	121	– 0.10(0.08)	0.58(0.07)	0.860	0.599	0.817
6+	136	– 0.05(0.07)	0.62(0.07)	0.837	0.636	0.787
7+	129	0.09(0.07)	0.62(0.07)	0.781	0.666	0.756
8+	121	– 0.05(0.06)	0.73(0.07)	0.648	0.688	0.725
9+	98	– 0.07(0.07)	0.63(0.08)*	0.714	0.703	0.697
10+	118	0.10(0.07)	0.57(0.07)	0.721	0.709	0.673
11+	101	0.00(0.07)	0.65(0.07)	0.663	0.707	0.654
12+	88	0.00(0.08)	0.71(0.08)	0.728	0.697	0.645
13+	79	– 0.02(0.08)	0.72(0.08)	0.686	0.680	0.645
14+	86	– 0.05(0.06)	0.73(0.06)	0.574	0.654	0.657
15+	61	– 0.01(0.08)	0.78(0.09)	0.648	0.621	0.683
16+	58	– 0.06(0.10)	0.64(0.10)	0.735	0.579	0.724
17+	43	– 0.10(0.12)	0.39(0.14)	0.775	0.530	0.783
18–19	47	– 0.15(0.11)	0.51(0.12)	0.721	0.473	0.862
Girls						
2+	82	0.00(0.10)	0.36(0.12)	0.938	0.322	0.954
3+	111	– 0.08(0.09)	0.34(0.09)	0.943	0.384	0.940
4+	139	0.13(0.08)	0.38(0.07)	0.949	0.437	0.919
5+	128	– 0.01(0.08)	0.54(0.07)	0.854	0.483	0.893
6+	128	– 0.01(0.08)	0.45(0.08)	0.872	0.521	0.863
7+	121	0.04(0.06)	0.70(0.07)	0.707	0.551	0.832
8+	129	– 0.00(0.08)	0.42(0.08)	0.917	0.573	0.801
9+	123	0.17(0.06)	0.64(0.07)	0.707	0.587	0.773
10+	113	0.08(0.06)	0.60(0.07)	0.632	0.593	0.749
11+	98	0.03(0.07)	0.70(0.07)	0.728	0.592	0.731
12+	105	0.01(0.08)	0.64(0.08)	0.768	0.582	0.721
13+	82	– 0.07(0.07)	0.49(0.07)	0.648	0.564	0.721
14+	70	– 0.13(0.09)	0.63(0.09)	0.762	0.539	0.733
15+	89	0.05(0.09)	0.50(0.10)	0.806	0.505	0.759
16+	56	– 0.16(0.11)	0.47(0.12)	0.806	0.464	0.800
17+	74	– 0.13(0.12)	0.25(0.12)	0.911	0.415	0.860
18–19	54	– 0.04(0.15)	0.37(0.16)	1.040	0.357	0.938

* Quadratic term gives $p < 0.05$
Note: α and β are the regression constant and slope respectively, and RSD is the square root of the residual mean square; SE stands for standard error.

ing models of log(weight) and height to age from which the Z-scores were derived. Thus, detailed weight-for-height by age tables were constructed for boys and girls, from which some summary results are presented for four age groups in table 2.

3.2. *BMI charts*

Details of the construction of the BMI charts for boys and girls living in Tehran and their general applicability to children in Iran are described elsewhere (Hosseini *et al*. 1999).

3.3. *Comparison of weight-for-height centiles with BMI centiles by age*

The 3rd, 50th and 97th centiles of weight-for-height centiles are compared with corresponding centiles derived from modelling BMI for boys in four age groups are

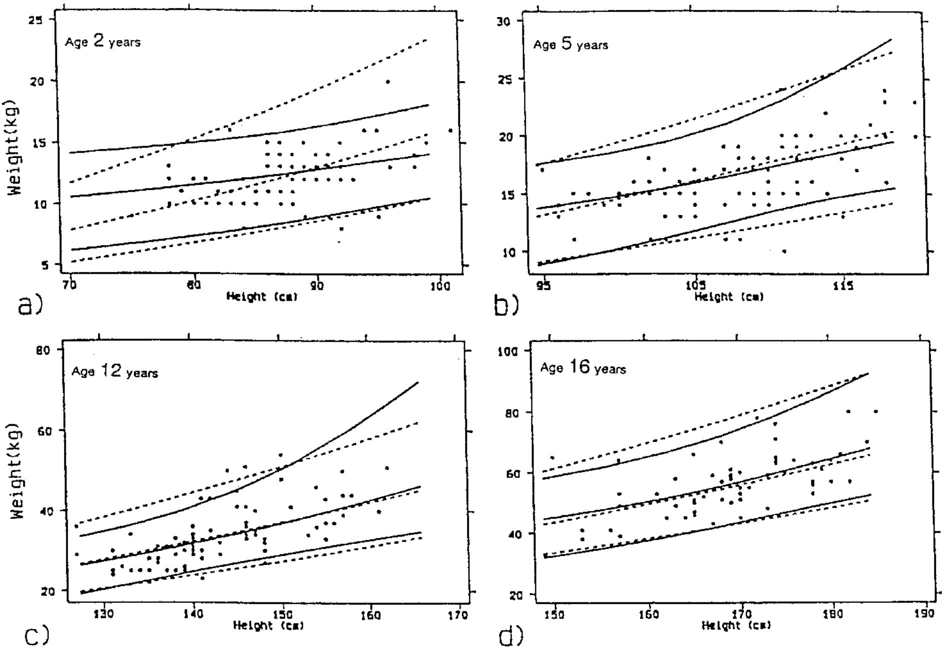

Figure 2. Weight-for-weight (solid line) for boys in four age groups compared with the corresponding centiles based on BMI (broken line). The centiles 3rd, 50th and 97th are shown, together with observations on boys living in urban Tehran.

Table 2. Smoothed percentiles of weight-for-weight by age and sex for urban Tehran children derived from modelling relationships of Z-scores of weight and height.

Smoothed centiles of weight (kg)									
Boys					Girls				
Height (cm)	Centile	3rd	50th	97th	Height (cm)	Centile	3rd	50th	97th
Age = 3+					Age = 3+				
79.9	3rd	6.97	11.52	15.11	78.1	3rd	7.03	11.41	14.96
94.9	50th	9.71	13.65	17.41	92.5	50th	9.02	12.80	17.20
106.0	97th	12.13	15.67	20.99	104.4	97th	10.73	14.21	20.90
Age = 5+					Age = 5+				
94.6	3rd	8.79	13.70	17.48	91.7	3rd	8.49	13.42	17.83
107.4	50th	12.53	16.48	21.08	105.5	50th	11.33	15.67	21.64
118.6	97th	15.51	19.53	28.41	117.6	97th	13.77	18.29	28.84
Age = 12+					Age = 12+				
127.4	3rd	19.27	26.44	33.54	128.0	3rd	17.65	26.78	37.35
145.0	50th	26.99	34.19	45.09	145.2	50th	24.96	35.06	49.75
165.8	97th	34.87	46.35	72.23	161.7	97th	32.93	46.21	72.04
Age = 16+					Age = 16+				
148.9	3rd	32.05	44.68	58.14	143.5	3rd	31.18	45.12	58.93
167.8	50th	42.14	55.26	71.78	159.0	50th	39.51	52.74	70.37
184.3	97th	52.51	67.93	92.36	172.0	97th	47.19	61.63	89.15

shown in figure 2. The weight for height data for Tehrani children are also shown. Figure 2a–d shows that the weight-for-height centiles satisfactorily present the pattern of the data although at age 12 for height taller than 155cm the 97th centile seems increasingly too high.

Comparing the centiles of weight for height based on BMI with the weight-for-height centiles we have computed for the data, we see that for 2-year-old boys (figure 2a) the 97th and 50th BMI centiles are low for shorter boys and the 97th centile especially is too high for taller ones, but the 3rd centiles are close. This means that, using BMI, some short 2-year-olds will be incorrectly labelled overweight, whereas taller 2-year-old boys who are overweight may be classified as within the normal range. Figure 2a shows that 2 of 82 boys in this age group come into the latter category. For the 5-year-old boys (figure 2b) the two sets of centiles are very similar. Three obese 12-year-old boys overweight for height (figure 2c) were not be identified by BMI because they were relatively short but relatively taller boys may be incorrectly classified as obese using BMI centiles. Figure 2d presents the comparison of weight-for-height centiles for 16-year-old boys; although the lower and 50th centiles are very close, two of the overweight for height boys are not if one assesses weight by the BMI.

The comparison of the weight-for-height centiles for girls with the corresponding obesity index defined by BMI revealed similar results to those found for boys and showed that over the age of five, the two sets of centiles are very similar. Inspection of similar graphs for all ages 2–18 for both sexes suggests that within the normal range for height, 1.8% of the children might be classified as outside the normal range of weight-for-height but within the normal range if weight for height is based on BMI. Similarly about 0.5% of children might be classified as having non-normal BMI although within normal range of weight-for-height. The discrepancy between these two percentages lies in the very short children, see below.

3.4. *Weight-for-height and Body Mass Index (BMI) outside Tehran*

Inspection of the height and weight data for other urban and rural children on charts comparable to figure 2, in one year age groups for ages 2–18 shows that from the age of six very few children have measurements that fall between the two sets of outer weight-for-height centile lines and the corresponding BMI centile lines, particularly in areas where the curves diverge. This means that assessing overweight and underweight by weight-for-height charts or BMI will almost always yield the same result.

There are some discrepancies in relation to children aged 2–5 years. Here, as in older age groups, the lower centile lines are very close so that both methods yield almost identical results when assessing lack of weight. The main difference between the two methods lies in the assessments of obesity in very short children in these younger age groups. Outside Tehran, of 322 3-year-old children living in urban areas, ten very short children would be judged to be overweight by body mass index, but are in the normal range of weight-for-height, see figure 3. In addition, figure 3 shows that six children would be judged of normal weight for height by BMI and overweight from weight-for-height centiles; also four children, underweight by weight-for-height, were within the normal range judged by BMI despite the 3rd centile lines being so close. So in this age group assessing weight for height by the 3rd and 97th BMI centiles would give 3.1% false positives and 3.2% false negatives

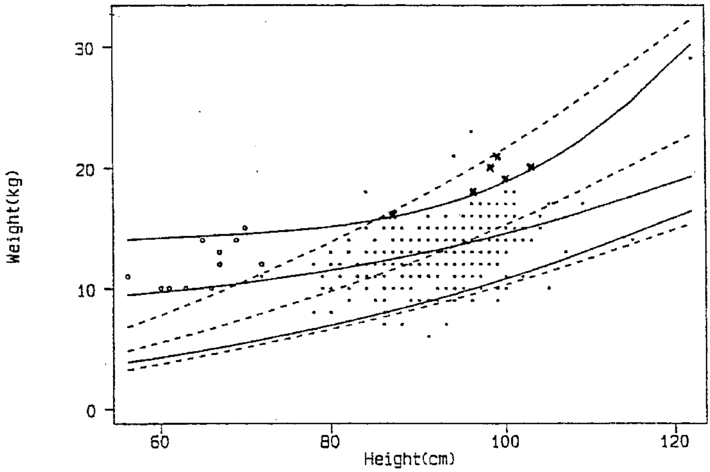

Figure 3. The fitted 3rd, 50th, 97th centiles of weight-for-height (——) and BMI (- - -) for 3-year-old boys in urban Tehran over total range of observed height with the weights and heights of boys in other urban areas. ○, observations, overweight by BMI but within normal range of weight-for-height. ×, observations normal by BMI and overweight by weight-for-height.

compared with an assessment using comparable weight-for-height centiles fitted to the data.

4. Discussion

To assess whether a child's weight is within the normal range for height and age, tables or charts giving of weight-for-height by age are required unless these can be summarized by a simple index, e.g. BMI. To examine this possibility we had first to construct weight for height centiles for each age group. We might have used our total data set of 22 349 children to do this, but in view of our previously reported differences in heights and weights in different provinces in Iran (Hosseini *et al.* 1998c), we have again used the Tehrani children for our standard. To overcome the problem of small numbers for setting the range of normal weight at the extreme values of height, we have adapted Ayatollahi's device (1995) of using the relationship between the ZWT for age to the ZHT for age. Like Ayatollahi, we found that, in the all age groups, the relationships between the Z-scores could be assumed to be linear with zero intercept. Ayatollahi (1995) further found that the relationship between the Z-scores was constant independent of sex or age within the range of his data. We found that the regression coefficients were not constant but were quadratically related with age and were significantly lower for girls, see figure 1a. This figure suggests that a constant relationship might be acceptable in the region of 6 to 12 years but at the peaks, our values of the regression coefficients are lower than those of Ayatollahi and that the relationship is significantly lower for girls.

Because the variances of ZWT and ZHT are approximately 1.0, the regression coefficients shown in table 1 are close to the correlation between ZWT and ZHT. At first it seems surprising that when weight for age and height for age are transformed to standard Normal deviates, weight and height have the highest correlation at puberty when the normal ranges for weight and heights are largest. However, because pubertal development affects both height and weight and occurs at different ages in different children, the increasing correlation between the Z-scores reflects the differing rates of development with age. When children near their final stage of development, the correlation diminishes.

To derive weight-for-height tables using all the Tehrani data we fitted smooth curves to the regression coefficients and the residuals, as shown in figure 1a and b, to estimate the normal ranges of weight-for-height in each age group. The analyses to determine the underlying relationship of ZWT to ZHT could have been based on the assumption that ZWT an ZHT are distributed as standard Normal deviates, which overall tests of goodness of fit of the weight and height charts suggest is tenable (Hosseini *et al.* 1998a). It might then be assumed that the intercepts are zero or the regression coefficients should be replaced by correlations and the RSD's computed as $s = \sqrt{(1 - r^2)}$. Such assumptions, make almost no difference to the coefficients, their se's and the fitted curves shown in figures 1a and 1b on which our estimate of the relationship of weight to height by age depend. The results of our modelling give weight-for-height centiles that fit the data well as shown by figures 2a–d. It is of particular interest that our model of weight-for-height extends to follow the pattern observed in very short children in urban areas outside Tehran, as shown in figure 3.

Studies of obesity are sometimes thought to require the measurements of skinfold thickness in addition to estimates of weight-for-height by age but, even when performed by trained personnel, they are unreliable (Hammer, Kraemer, Wilson *et al.* 1991) and are inappropriate for everyday use in Iran. More relevant is the question as to whether the weight for height by age centiles can be collapsed into a simple index of weight for height.

There has been a considerable search for age independent methods of assessing obesity from weight and height data. This has led to the use of indices of the form $I_p = \text{weight}/(\text{height})^p$, where p is chosen so that I_p is highly correlated with weight and uncorrelated with height (Benn 1971). However, the optimum value of p changes with age. To find the best power for each sex and age group, obesity indices of the form I_p were calculated for a range of values of constant p. Then the value of p for which the correlation of I_p with weight was the highest and with height was the lowest was chosen. In our data the best choice of p is 1.3, 2.2, 2.5, and 1.9 for male age groups 2–5, 6–10, 11–15 and 16–18 years respectively, with a similar pattern for girls. As already noted, Cole *et al.* (1995) chose 2 as the best integer value for p, to construct BMI charts for assessing obesity in children in the UK. The low values of p for the 2–5 year old Tehrani children suggests that BMI may not be the best index for assessing young Iranian children, but that after the age of six BMI would be satisfactory.

Above the age of six, the similarity of the weight-for-height centiles to comparable centiles based on BMI shown in figure 2 confirms that this is true. Below the age of six, use of the upper BMI centiles will result in a proportion of short children being designated substantially overweight and some taller overweight children being designated as within the normal range. Although the proportions of children likely to be misclassified by BMI is small, for the short children differences between the weight for height and BMI centiles may be over 30% of body weight and, because the differences can be so large, supplementary tables for assessing the upper centiles of weight-for-height for children whose heights are below the 50th centile are given in the Appendix.

Thus we conclude that, with the exception described above, weight-for-height by age may be assessed by calculating the child's body mass index and comparing this with centiles of BMI by age. Hosseini *et al.* (1999) show, however, that BMI is dependent on age and to a lesser degree on sex. The comparison of BMI centiles for UK and Iran in that paper also shows that although from the age of six the 97th centiles are similar the lower centiles in Iran are substantially below those of the UK. Therefore, although BMI summarizes the relationship of weight to height for almost all children in Iran, population specific BMI norms are required if they are to be used in everyday practice.

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Appendix 1. Smoothed percentiles of weight-for-height for children aged 2 to 5 years with heights below and weights above the 50th centiles.

Boys						Girls					
		Weight (kg)						Weight (kg)			
Height (cm)	Urban Centile	50th	75th	90th	97th	Height (cm)	Urban Centile	50th	75th	90th	97th
Age = 2+						Age = 2+					
64.4	1st	10.10	11.46	12.60	13.67	65.5	1st	10.34	11.45	12.37	13.38
70.1	3rd	10.54	11.89	13.00	14.06	70.4	3rd	10.60	11.67	12.61	13.68
76.6	10th	11.15	12.45	13.53	14.60	76.2	10th	10.94	11.98	12.94	14.11
82.1	25th	11.75	13.00	14.07	15.16	81.1	25th	11.26	12.29	13.31	14.60
87.1	50th	12.38	13.59	14.67	15.83	85.9	50th	11.61	12.65	13.75	15.22
Age = 3+						Age = 3+					
74.7	1st	10.96	12.38	13.54	14.63	73.4	1st	11.06	12.31	13.38	14.56
79.9	3rd	11.52	12.88	14.01	15.11	78.1	3rd	11.41	12.63	13.72	14.96
85.7	10th	12.24	13.53	14.64	15.77	83.5	10th	11.87	13.06	14.20	15.57
90.4	25th	12.92	14.17	15.29	16.50	88.1	25th	12.31	13.51	14.72	16.28
94.9	50th	13.65	14.86	16.06	17.41	92.5	50th	12.80	14.03	15.37	17.20
Age = 4+						Age = 4+					
83.2	1st	11.92	13.37	14.55	15.67	80.6	1st	11.90	13.28	14.49	15.80
87.9	3rd	12.57	13.95	15.10	16.23	85.1	3rd	12.35	13.70	14.93	16.34
93.1	10th	13.93	14.70	15.84	17.04	90.3	10th	12.93	14.27	15.56	17.14
97.5	25th	14.18	15.44	16.62	17.95	94.8	25th	13.50	14.86	16.27	18.08
101.5	50th	15.00	16.29	17.58	19.15	99.1	50th	14.14	15.57	17.17	19.33
Age = 5 - 6						Age = 5-6					
90.2	1st	12.96	14.45	15.67	16.83	87.2	1st	12.87	14.39	15.72	17.17
94.6	3rd	13.70	15.12	16.30	17.48	91.7	3rd	13.42	14.91	16.28	17.83
99.5	10th	14.64	15.97	17.16	18.44	96.8	10th	14.15	15.63	17.08	18.83
103.5	25th	15.53	16.83	18.09	19.56	101.2	25th	14.86	16.39	17.98	20.03
107.4	50th	16.48	17.84	19.27	21.08	105.5	50th	15.67	17.31	19.15	21.64

Zusammenfassung. Die Körperhöhen- und Körpergewichtsdaten aus dem in den Jahren 1990 bis 1992 im Iran durchgeführten National Health Survey, einer Zufallsclusterstichprobe von 1 aus 1000 Familien, wurden ausgewertet. Aus der Beziehung zwischen den altersspezifischen Körpergewichts- und den altersspezifischen Körperhöhen-Z-scores wurden körperhöhenspezifische Perzentile für Kinder und Jugendliche im Alter von 2 bis 18 Jahren berechnet. Die so gewonnenen Perzentile wurden mit den körperhöhenspezifischen Perzentilen verglichen, die auf BMI (Gewicht/Höhe^2)-Kurven basieren. Eine altersspezifische Analyse der Datenpunkte ergab, dass es sehr wenige Beobachtungen zwischen den zwei Sets von P3 und P97 gab, so dass die normale Variationsbreite des altersspezifischen BMI effektiv der normalen Variationsbreite des körperhöhenspezifischen Gewichts nach Alter äquivalent ist. Eine weitere Analyse zeigte, dass BMI Kurven, die auf einer Substichprobe städtischer Teheraner Kinder basiert, zuverlässig zur Bestimmung der normalen Variationsbreite des körperhöhenspezifischen Gewichts für alle Kinder im Iran herangezogen werden kann, ausgenommen kleinwüchsige Kinder im Alter zwischen 2 und 5 Jahren, für die eine Tabelle mit den oberen Perzentilwerten angegeben wird.

Résumé. Des données de poids et de stature ont été obtenues à partir de l'Enquête Nationale de Santé de 1990-92, un échantillonnage aléatoire de 1 famille pour 1000 en Iran. Les centiles du poids-pour-la-taille d'enfants et d'adolescents de Téhéran âgés de 2 à 18 ans ont été calculés à partir des associations des z-scores du poids pour l'âge et de la stature pour l'âge. Les centiles obtenus sont comparés aux centiles du poids pour la taille fondés sur des graphiques d'IMC (poids/stature^2). L'examen des observations âge par âge montre qu'il y a très peu de points au niveau des 3ème et 97ème centiles, si bien que la variation normale de l'IMC par âge est équivalente à la variation normale du poids-pour-la-taille en fonction de l'âge. Une

analyse subséquente montre que les graphiques d'IMC établis à partir des sous-échantillons d'enfants vivant dans la ville de Téhéran peuvent être utilisés avec confiance pour déterminer la variation normale du poids-pour-la-taille pour tous les enfants iraniens, à l'exception des enfants de petite stature âgés de 2 à 5 ans pour lesquels on joint une table des centiles plus élevés.