

# Glücksburger Auxologie-Tage. Wissenschaftliche Tagung der Deutschen Gesellschaft für Auxologie

14.–17.November 2002  
in Schloß Glücksburg, Schleswig-Holstein.  
Leitung: Michael Hermanussen

## Does the value of the 97th BMI percentile of the reference population correspond to the agreed lower limit value for obesity?

Bláha P<sup>1</sup>, Vignerová J<sup>2</sup>

<sup>1</sup> Charles University Prague, Faculty of Science,  
Dept. of Anthropology and Human Genetics, Czech Republic;

<sup>2</sup> National Institute of Public Health, Prague, Dept. of Biostatistics,  
Czech Republic

Mainly the BMI is worldwide used for the assessment of the weight/height ratio. As in children and adolescents, the BMI markedly change with age, BMI categories elaborated for adult populations cannot be used in this sub-population. Therefore, we use percentile charts from birth to the age of 18 years for the Czech population, which are based on the results of the Vth Nationwide Anthropological Survey of 1991. Subjects with a BMI above the 90th percentile are defined as overweight, those above the 97th percentile as obese. The objectivity of the critical 97th BMI percentile as the lower limit of obesity was tested in a group of 8800 Czech children and adolescents, aged 6 to 19 years who were considered obese. This group provided also baseline values for the definition of three grades of obesity according to BMI, in relation to age and sex, and data for the elaboration and presentation of a table "Marginal values of the BMI index defining three grades of obesity of the Czech child and adolescent population." The 97th percentile of the reference population served as the lower limit of grade I obesity. The 50th percentile of the investigated obese sub-population served as the upper limit of grade I. Grade II comprises subjects between the 50th and 90th percentile of the obese sub-population. Grade III includes subjects with BMI values above the 90th percentile.

This research is supported by the Internal Grant Agency MofH,CR, grant no.NB6597-3/2001.

## Statistical model for individual growth monitoring and prediction

Brabec M

Department of Biostatistics, National Institute of Public Health,  
Czech Republic

A statistical approach will be describe, applicable to model longitudinal growth data. The resulting model can be helpful for making short-term predictions of growth. We will illustrate its performance on real data from a large semi-longitudinal ongoing Czech growth study. Statistically, the model is based on a state-space approach to time series of measurements taken on the same individual. We use Kalman filtering to be able to compute short-term predictions and smoothing (i.e. corrections for measurement error). Substantial feature is that the model is able to borrow certain information among individuals when estimating parameters, and hence it is able to use relatively short series

of measurements from semi-longitudinal data. Operationally, the model is "trained" on a large data set, but once its parameters are estimated, it can be applied on measurements of a particular individual – yielding predictions and their confidence intervals. From the practical point of view, it can be useful for a kind of "individual monitoring." That is, for a formal examination of growth status and growth dynamics of an individual child, and for subsequent assessment of whether any intervention is needed.

## Transformation of body and head shape in Moscow schoolchildren: secular aspects

Godina EZ

Institute and Museum of Anthropology, Moscow State University,  
Russia.

Based on the results of several successive cross-sectional studies of Moscow schoolchildren, secular changes in body and head dimensions have been investigated. Data on children from 8 to 17 measured in the 1970's, 1980's and 1990's (all in all about 10,000 individuals) have been compared. Some historical data on growth and development of children from the 1940's and 1960's have also been used for comparative purposes. The program included about 50 anthropometric measurements (length measurements, body diameters, circumferences, skinfold thickness, bone widths, head and face dimensions). Several indices were computed, including cephalic and body mass index (BMI). Stages of development of secondary sex characters were evaluated, as well as menarcheal age by status-quo method. For both sexes and for each age class, there are significant differences in such variables, as stature, between 1990's and 1970's, 1980's and 1970's ( $p < 0.001$ ), while the differences between 1990's and 1980's are statistically non-significant. Positive and highly significant differences ( $p < 0.001$ ) in body weight were typical only for boys of the first two series. No changes between 1980's and 1990's have been noted. For girls of the three series, no significant changes were revealed. Differences in chest circumference show reverse pattern of negative changes in the latest series both for the boys and the girls. There are noticeable changes in head and face measurements, which are expressed in more elongated head and face shape in contemporary children as compared to the data from the 1940's and the 1960's. Possible causes of debrachicephalization are discussed. The argument is that this is a part of astenization and leptosomization processes, which go along with secular changes. This trend is revealed not only by recent data but also in the course of human evolution (Khriisanfova, 2002). Distribution of somatotypes (evaluated by Shtefko-Ostrovsky method) show the increasing frequencies of the so-called "astenoid" (ectomorph) type in the latest series (particularly in the 1990's). The analysis of intra-group variability has shown that among somatotypes the most pronounced secular

changes are typical for children of the astenoid type. They have the highest values of canonic correlation coefficients between head and face, and body measurements. This may suggest a "resonance" response of this particular type to secular changes.

## Final growth arrest in Bronze Age cremated human tibiae

Hermanussen M, Kühl I\*

Aschauhof, Germany \*Schleswig, Germany

Unfavourable living conditions during childhood may not only lead to temporary growth arrest and short stature in adults, but may result in radiographically apparent transverse sclerotic zones in long bones ("growth arrest lines", "Harris's lines"). Harris's lines are found in children, adolescents, and young adults, but in older individuals, tend to undergo resorption. Harris's lines are also found in prehistoric bones and bone fragments. We present fragments of proximal tibiae, from 12 individuals that were identified amongst numerous human bone fragments from Bronze Age and pre-Roman Iron Age cremation sites. All fragments show Harris's lines and also include the "fusion line" that occurs when the growth plate finally fuses. In some fragments, the sequences of Harris's lines are astonishingly regular, with almost equidistant "steps" close to once every 4 to 5 mm. This distance is similar to a one year growth rate of the proximal tibial growth plate. I.e., the bone fragments suggest repeated growth disturbances at annual intervals, such as late winter famine, and may be considered natural records of late adolescent growth. Yet if this is true, these ancient records differ markedly from modern growth. Modern adolescents exhibit a pubertal growth spurt, and decelerate in growth thereafter for several years so that one would expect large spaces between the "pubertal" growth arrests lines, and gradually decreasing spaces until the growth plate fuses. We hypothesise that these Bronze Age and pre-Roman Iron Age people who lived under so poor an environmental condition that annual growth arrest lines developed, neither exhibited a pubertal growth spurt, nor did they exhibit the period of declining growth velocity that follows pubertal growth for several years in modern individuals. Absence of both of these phenomena might have contributed to the shortness of body stature in these people.

## Short statured children show a retarded and tall children an accelerated bone age

Hoepffner W, Gausche R, Keller E

University Hospital for Children and Adolescents, Leipzig, Germany

**Aim of the study:** Evaluation of the relations between chronological age (CA) and bone age (BA) in constitutionally short and tall children. **Method:** Records of children were collected from questions addressed to the CresNet®. Those children were recruited who showed a normal growth velocity and in whom the results of basic investigations were not suspicious for endocrine disorders or of disorders of bone age development. The height-SDS was  $\leq -1.88$  ( $m = -2.37 \pm 0.43$ ) respectively  $\geq 1.88$  SDS ( $m = 2.49 \pm 0.52$ ) according to the synthetic norm curves of Hermanussen. BA and BA-SDS were determined according to Greulich-Pyle. **Results:** Short stature: 53 boys and 52 girls with a CA between 1 and 18 years were included. Their mean CA was  $9.28 \pm 4.38$  years, their BA  $8.16 \pm 4.43$  years, respectively. The ratio of BA/CA was  $0.85 \pm 0.15$  and the BA-SDS was  $-1.42 \pm 1.36$ . Tall stature: The majority of the 38 boys and 35 girls were in their pubertal age. The CA of the children was  $11.17 \pm 2.65$  years and the BA was  $12.7 \pm 2.7$  years, while the ratio of BA/CA was  $1.15 \pm 0.11$  and the BA-SDS was  $1.77 \pm 1.25$ . **Conclusions:** Short stature is associated with a tendency of retardation of BA, while tall stature is associated with an equal tendency of acceleration of BA. This represents the explanation of the biological phenomenon of the "regression to the mean."

## Secular changes in growth of school-children in Poland

Barbara Hulanicka

Inst. Anthropology, Polish Acad. Sci., Kuznica 35, Wrocław 50951, Poland

To study the secular changes in the body height of Polish children a computerised database has been created. The data recorded between 1888 and 2000 have been gathered from some 200 publications (majority in Polish). The aim of this presentation is a brief description of these data. The existing evidence shows that at the beginning of twenty century, the average height of children was the same for all the social strata, rich and poor alike and did not change in time. The changing pattern of growth of children and youth has been observed in Poland only during the last eighty years. According to the records, only in the twenties of the last century the children started to grow taller and their average height became greater. Analysis of the data gathered after World War II indicates that the environmental factors, less favourable in the country than in the cities, and different in various regions of Poland, differentiated growth of children. Indeed, children who grew in the cities and towns appeared to be taller than the one in the villages, and children from Wielkopolska-the western region of Poland were taller than the ones from the regions in Galicia, South East Poland. Prevalence of this phenomenon till the end of XX century is worth noticing.

## CrescNet – an efficient Network for the Evaluation of the Development of Growth and Body Weight in Children

Keller E

University Hospital for Children and Adolescents, Leipzig, Germany

**Introduction:** CrescNet represents a network for the early detection of disturbances of the development of growth and body weight. Since 1998 data of height and body weight of children from associated paediatricians were collected.

**Methods:** The measured results of every single year (in 2001 from 67,337 children and adolescents) have been analysed and percentiles calculated. The most actual evaluation (from 2001) was compared with the well accepted data of the literature (Prader, Hesse, Zabransky, Kromeyer-Hauschild). In a second step curves were analysed. By a screening method suspicious data are detected and the paediatrician is informed about that.

**Results:** The percentiles for height of the single years produced by CrescNet, do not change. Only if compared with older studies, a marked acceleration of the height of 10 to 14 years old children was observed. The data of CrescNet show an increase for body weight and consequently also for body mass index (BMI) especially for the high percentiles. Compared with older percentiles for body weight, the mean increase consists of about 10 kg. For adolescents the difference is nearly 24 kg when compared with Prader's data. If single cases were analysed, in 6.6% ( $n = 7997$ ) of all the evaluated children additional measures seemed to be necessary.

**Conclusion:** The data pool of CrescNet accomplishes the evaluation of single courses and also the visualisation of developmental trends for height and weight. CrescNet therefore, means a contribution for quality control in paediatric care.

## Computer simulation of growth in pigs

Knap PW

PIC International Group, Ratsteich 31, 24837 Schleswig, Germany

Body growth is one of the most important biological aspects of the commercial pig production sector. Pigs are slaughtered before the onset of puberty, commonly between 100 and 125 kg live weight at about half a year of age. Economic margins in pig production are often very