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Meeting Reports

"Proceedings of the 22nd Aschauer Soiree on Growth and Health Screening", held at Altenhof, Germany, November 15th, 2014

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Abstract

Twenty-five scientists met at Aschauhof, Altenhof, Germany, to discuss various aspects of the complex network of modern health screening, focusing on current scientific topics including medical sciences, human biology, and mathematics; on problems in implementing these results at the practical level of physicians, nurses, technicians, and engineers; and the level of administrative and political decisions. Whereas major scientific advancements have been published in the understanding and the bio-statistical evaluation of anthropometric screening parameters such as serial measurements of height and weight for preventive medical check-ups, BMI screening and surveillance in schools, etc., the implementation of these advancements into current health screening concepts, strategies and decision-making is poor. Fear of discrimination, misperception of body image, behavioural responses and political concerns, meanwhile dominate and negatively interfere with the implementation of recent scientific results into public health screening concepts and practices.

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Christiane Scheffler summarized the aims of modern health screening: detecting risk factors for future health problems, early recognition of illness, minimizing costs, optimizing living and working place conditions, and providing optimum adaptation of the technical environment to the human worker. She distinguished between the scientific level including biology, anthropology, and mathematics; the practical level including the paediatrician, the nutritionist, but also engineers and designers; and the administrative level including institutions, medical authorities and organisations, and the political level. Scheffler highlighted the poor communication within this complex network.

Janina Tutkuviene discussed the relevance of BMI for obesity screening during adolescence, and presented data on body size indices of some 2500 children and adolescents from Vilnius city. Sorted rotated factor loadings for BMI and other body size measurements showed that BMI is not necessarily associated with body fat and skinfold measures, but also with parameters indicating body robustness such as elbow, knee and ankle width, chest depth, bicristal width and head circumference. Crosstabs for percent agreement between BMI and body (subcutaneous) percent body fat (**Figure 1**) showed that BMI is not an accurate indicator of true obesity. BMI must be considered with other measures of body fatness, especially when screening and determining obesity in adolescent boys of 13-16 years of age. It remains to be elucidated to what extent BMI as a body size indicator with regard to lean body mass is related to “healthiness”, morbidity and mortality.

13-14 y. boys			
BMI	% Body Fat		
	Low	Medium	High
Low	39.3	52.5	8.2
Medium	21.1	59.3	19.5
High	18.0	29.5	52.5

13-14 y. girls			
BMI	% Body Fat		
	Low	Medium	High
Low	50.8	45.9	3.3
Medium	21.3	63.9	14.8
High	6.6	26.2	67.2

15-16 y. boys			
BMI	% Body Fat		
	Low	Medium	High
Low	41.5	49.1	9.4
Medium	24.5	58.5	17.0
High	9.4	34.0	56.6

15-16 y. girls			
BMI	% Body Fat		
	Low	Medium	High
Low	59.0	37.7	3,3
Medium	18.5	63.9	17.6
High	3.3	35.0	61.7

17-18 y. boys			
BMI	% Body Fat		
	Low	Medium	High
Low	57.6	39.4	3.0
Medium	19.1	58.8	22.1
High	2.9	44.1	52.9

17-18 y. girls			
BMI	% Body Fat		
	Low	Medium	High
Low	60.0	40.0	0.0
Medium	21.2	65.9	12.9
High	4.4	28.9	66.7

***Figure 1.** Percent agreement between BMI and body fat % in adolescents aged 13-18 years*

Antonio D. Cámara discussed the role of adult heights in telling about the net nutritional status of children and adolescents in past populations. He presented height data of adult male landowners' and peasants' sons from Santafe (Andalusia) born 1860-1942, male data from Montefrio (Andalusia) born 1830-1944, and whole Spain Cohorts born 1910-1960 and related hardships (nutritional stress and duration of exposure to war and post-war) to height. In these years, the secular trend deviated. At the population level, warfare-related effects on growth mostly associated with nutritional stress, were found to be greater among cohorts that were exposed after infancy (e.g. during the adolescent spurt or during the final stage of physical growth). Cámara concluded that nutrition itself was not the main driving force behind the variations of mean adult height during the 19th century and the first decades of the 20th century. Equal or greater plasticity in height was observed among persons from upper classes.

Natalia Nowak-Szczepanska, Aleksandra Gomula and Slawomir Koziel presented details of cross-sectional anthropological surveys performed in 1966, 1978, 1988 and 2012, in 34,829 boys and 34,917 girls aged 7-18 years. They revealed the impact of social factors on the prevalence of pooled overweight and obesity, and underweight in children and adolescents in Poland during last nearly 50 years. The lowest prevalence of overweight was found in 1966, the highest prevalence in 2012. The influence of social factors on the risk of overweight and obesity (OW&OB) is higher in boys than in girls, the highest influence of social factors on the risk of OW&OB was mainly observed in 1978, the lowest influence in 2012, except for late adolescent girls between 1988 and 2012. Urbanization as a social factor increased the risk of overweight and obesity almost fourfold in boys in 1978, but almost completely lost its influence on the risk of obesity thereafter.

The risk of underweight (UW) in childhood and adolescents strongly decreased. Highest prevalence was found in 1966, lowest in 2012. There was a lack of a constant pattern of the influence of social factors on the risk of UW depending on sex, with highest influence of social factors on the risk of UW in 1978 for boys, in 1966 in girls, and lowest influence of social factors on the risk of UW in 2012 (except for the number of children in girls in the family). Social factors appeared to influence the risk of OW&OB more frequently than the risk of UW.

The surveys showed that in recent years, the socioeconomic status has lost its differentiating effect on height, BMI in boys and girls as well as on menarche in girls. In view of comments of Lindgren (1) who reported disappearing of differences in children's growth between upper and lower social strata in Sweden, Nowak-Szczepanska, Gomula and Koziel suggested that also Poland appears to be on the right track to such biological egalitarianism.

Anna Anisimova, Elena Godina and Sergei Rudnev presented the results of bioimpedance analysis obtained in Moscow Health Centers (S. Rudnev) and in Moscow secondary schools (A. Anisimova and E. Godina). The main goal of this study was to check the representativeness of data from the two sources. A comparative study of body composition was conducted in two groups of children and adolescents aged 7-18 years: **1.** those measured at secondary schools (n = 1949, the study group) and **2.** those measured at Health Centers (n = 48,300 control group). With regard to age trends and characteristics of excess/lack of body mass, the observed data were in good agreement, with a slight shift towards overweight in the study group relative to the control group (median BMI z-scores +0.06 for boys and +0.09 for girls). The pronounced intra- and inter-group differences in relative abundance of fat and lean mass were observed due to variation of physical activity level and nutritional status. Male students of the sports school have values of fat mass lower than the 50th percentile of the Health Centers and lean body mass higher than the corresponding 50th percentile values. For the girls the values of both parameters were relatively evenly distributed around the 50th percentile curve. The results indicate feasibility of using bioimpedance data from Health Centers for population screening and monitoring in children and adolescents.

Leslie Sue Lieberman reported on BMI screening and surveillance in schools in the US. The high prevalence of overweight and obesity was the rationale to institute school-based screening to bring awareness to the problem and facilitate the institution of prevention treatment programs. The prevalence of overweight/obese girls was 14.5%/17.2%, boys 15.4/16.7%. 8.4% of 2 - 5-year-olds, 17.7% of 6 - 11-year-olds, and 20.5% of 12 - 19-year-olds were obese. The prevalence by ethnicity and race was: Hispanic 22.4%, Black 20.2%, Non-Hispanic White 14.1% and Asian 8.6% (2). In 2003 Arkansas was the first state to require measurement of BMI resulting in no increase bullying and better exercise/ sports participation and family nutrition. Ten years later, 21 states mandated BMI screening. But at least 4 state legislatures have or had bills prohibiting BMI measurement in schools (3). National trends and the role of interventions are monitored on national, local and individual levels and screenings included parental information. In view of the $14.3 billion annual direct medical costs for childhood obesity, BMI screening and surveillance in schools appeared comparably inexpensive, with minimal training, high specificity and moderate sensitivity (4).

Yet, a strong and adverse reaction was found by a large number of people. Parents opposed the BMI screening in US public schools, they feared misclassification of athletic children, racial and ethnic discrimination, peer harassment/ bullying, and they felt stigmatized and labelled by "Fat Letters" sent to their children (3). Anti-government sentiments occurred against Obama's revisions in the national school food programs promoting healthy lifestyles ("Lets Move"). Meanwhile a survey of paediatricians in Massachusetts found that (12.9%) strongly opposed school BMI measurements (5). The competence in schools to measure accurately and provide weight loss guidance is questioned. American views on obesity are changing. Among boys and girls age 8-15 years about 81% of overweight boys and 71% of overweight girls believe that they were about the right weight, about 48% of obese boys and 36% of obese girls consider themselves to be about the right weight. The prevalence of weight status misperception is lowest among children and adolescents from higher income families (26.3%) compared with middle income (30.7%) or lower income (32.5%) families (2). The embodiment of the fat stigma and its internalization and discrimination meanwhile affects bio-behavioural responses that maintain or increase fatness and make children, adolescents and females more vulnerable (6). The children's perceptions and the fat stigma has been tracked since the 1960's using a picture ranking task (healthy, crutches, left hand missing, wheelchair, disfigured face, obese – obese children rank last) and silhouette task (obese children rank least desirable), and shows worsening perception of obese children by peers (ages 3 and older) (7).

Christiane Scheffler showed the feminisation of the body fat distribution pattern in children in recent years. Body fat distributes with prevalence of subcutaneous fat (gynoid, pear shape) on the lower extremities in the females, and prevalence of trunk visceral fat (android, apple shape) in the males. Whereas the gynoid pattern may be viewed as evolutionary reserve for pregnancy and breastfeeding, the android pattern implies high risk for coronary heart diseases independent of BMI (8), high systolic and diastolic blood pressure (9) diabetes type II (10,11) and gallbladder disease (10). Scheffler discussed possible roles of endocrine disrupting chemicals on sex specific fat patterns. Some 70,000 documented synthetic chemicals (e.g. Phthalates, PCB, Bisphenol A (BPA), phytoestrogenes, polycarbonate plastics and others) are found in the food chain (fresh water fish, meat, etc.), in contaminated household dust, and in other sources. These chemicals can influence human endogenous steroid levels, might lead to feminisation of male offspring, and possibly influence sex dimorphic behaviour (12,13). Scheffler presented almost 60,000 measurement of skinfold thickness (subscapular, triceps, hip) in 7- 18 year old children and adolescents, and calculated various skinfold ratios (triceps/ subscapular; triceps/hip; hip/subscapular) and performed separate analyses for under-, normal-, and overweight children, in 1980-1994, and in 1995-2012. In all BMI groups and in both sexes the skinfold ratios triceps/subscapular, and hip/subscapular increased, whereas no changes were found in the ratio triceps/hip indicating feminized skinfold pattern in both sexes. **Figure 2** shows triceps/subscapular skinfold ratios in 1980-1994 and in 1995-2012. It is suggestive to assume influenced of endocrine disrupting chemicals, but the patho-physiology of this mechanisms remains unclear due to lack of information on the individual exposition to endocrine disrupting chemicals.

Karolina Bartkute raised some methodological problems in using reference curves, and presented her work on growth of premature infants. Gestation related optimal weight (GROW) percentiles are individually adjusted for physiological pregnancy variables (maternal height, weight, parity and ethnic group); they are 'optimised' to obtain the true growth potential, with pathological variables such as smoking being excluded; optimal weight is calculated using a foetal rather than a neonatal weight standard. Preterm neonatal weights are abnormal by definition, and are often affected by foetal growth retardation preceding spontaneous or iatrogenic preterm delivery. A birth-weight-based reference can thus be expected to underestimate growth restriction in preterm foetuses (14,15). E.g. at 32 weeks, a 1500g baby would fall within normal birth weight limits, but is small according to a 32 week foetal weight standard derived from normal term pregnancies (16). The third centiles of ultrasound measures and newborn weights diverge markedly between 25 and 36 weeks of gestation and by more than 400 g at 32-33 weeks. Despite this criticism, size at birth is generally accepted as

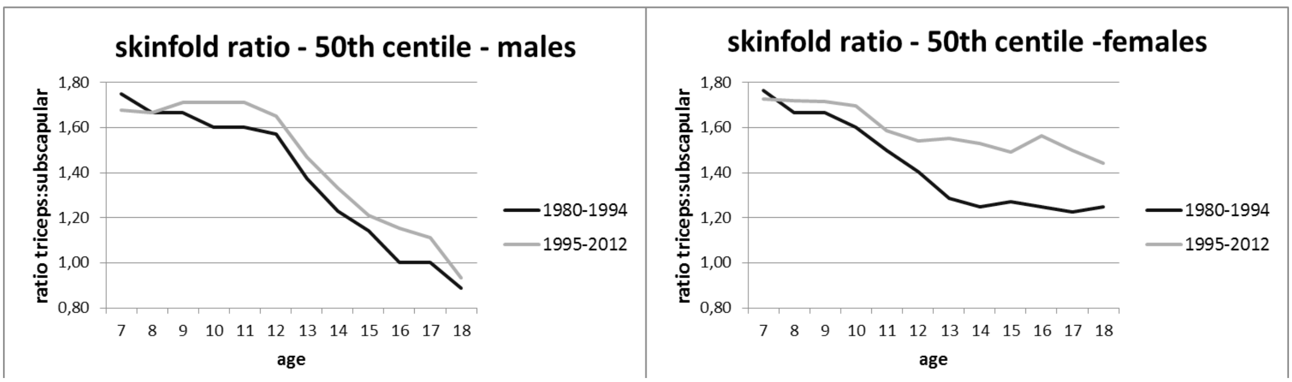

Figure 2. Age pattern of the 50th centile of the triceps/subscapular skinfold ratio in two historic time periods (1980-1994 and 1995-2012) in normal weight children.

representative of foetal growth and is currently used in many neonatal weight charts (17-19).

Most preterm babies will show slow initial weight gain or weight loss. This means they will appear to fall on the chart (Royal College of Paediatrics and Child Health, 2009). At all ages, median height and weight of preterm children remains lower compared with full-term children (20). Currently no consensus exists regarding optimum references to be used for preterm infant. Bartkute stressed that references for birth length and weight according to postmenstrual age must not be mistaken for longitudinal growth references for preterm infants; she underscored the importance of ultrasound studies measuring intrauterine dimensions rather then anthropometric data obtained at birth. Finally it needs to be mentioned that references in general, tend to mirror the technical advancements in perinatal care.

Natalija Novokmet summarized some of the scientific focuses of the Institute for Anthropological Research, Zagreb, Croatia, with emphasis on the study of Croatian population structure. Croatian island populations are recognized as one of the few persisting European isolates. Analyses of their genetic structures based on microsatellite markers (STRs), mitochondrial (mtDNA) and Y chromosome haplogroups showed a reduced genetic diversity within the island populations in comparison to the general Croatian population along with a differentiation among and within island populations. Biological structure of the island of Hvar was investigated by using the data on anthropometric variation among nine village populations. 24 body dimensions of 487 male and 437 female adult individuals were analysed. The observed patterns of variation among villages were closely related to geography, suggesting migration to be an important factor in the formation of the island‘s population structure (21). Croatian island isolates (e.g. island of Hvar) may serve as a model for studying of the process of microevolution. Substantially high prevalence of the metabolic syndrome was found (22) despite a relatively traditional lifestyle in rural habitats combined with a "Mediterranean diet". As the prevalence of the metabolic syndrome is significantly higher in the Croatian islands than in the rest of Europe or the USA, factors other than nutritional practices could be important in its predisposition.

Jani Söderhäll presented recent progress of software tools for height and weight screening in children, based on an extensive library of growth and pubertal development data from international literature. The library spans a large portion of the published reference tables of national, local or syndrome growth charts from the last two, three decades. The growth chart data sets published have been reviewed, classified and computerized for easy access in a standardized format and cover auxology and pubertal development as well as some laboratory data relevant in the endocrine field. Data from the library is used to create computerized growth charts with emphasis on keeping screen design identical to the national paper growth charts physicians and nurses traditionally use. This format enables easy, immediate recognition and more accurate interpretation of growth patterns. Recent progress has been attained in the design and publication of the new national Danish growth charts, in creating the first national Colombian growth charts, and in designing growth charts for achondroplasia children of German and Nordic origin. Ongoing projects include work on charts that will provide a manual way to estimate and follow the International Obesity Task Force's overweight levels for individual children. He also summarized recent work in the Patient Registry area with applications used primarily for rare diseases and paediatric endocrinology.

Post-menarcheal girls are taller, heavier and have a higher BMI than pre-menarcheal girls of the same chronological age (23). Rebekka Mumm illustrated very similar influences of the individual developmental tempo on the evaluation of BMI in boys of the German KiGGS study (24,25). She related BMI and percent body fat in 1798 boys aged 10-17 without voice break (pre-mutation), with BMI and percent body fat in 1335 boys aged 10-17 who had completed voice break (post-mutation). **Figure 3** illustrates that post-mutation boys have lower percent body fat than pre-mutation boys with the same BMI. The data suggest that the higher BMI of early maturing boys is not an expression of higher percent body fat, and thus should not be misinterpreted as overweight/obesity.

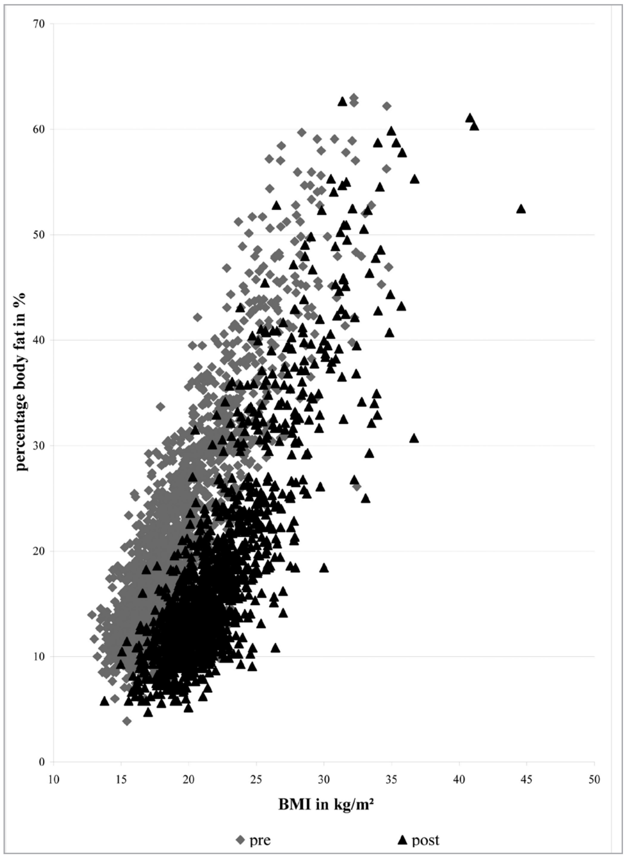

Figure 3. BMI related to percent body fat in boys before (grey rectangles, pre-mutation) and after voice mutation (black triangles, post-mutation)

Christian Aßmann discussed several issues arising in growth model comparison, where model comparison in particular has two dimensions. First, a model is fit, if the exploratory power of a model fitted to a specific data set with regard to this data set (in-sample fit) is high, and second, a model is fit, if the predictive power of this model fitted to a specific data set with regard to another data set (out-of-sample fit) is high as well. Different designs were presented in order to compare different model approaches along these two dimensions. Next to a simulation based cross-validation experiment to assess the discriminatory power of model selection devices for detecting which model is best suited to describe observed data, also the predictive power of different models for specific diagnostic purposes has been presented. To illustrate the necessity to cope with different model specifications for diagnostic purposes, the event that an individual's height at a specific time is below the 2.5% quantile of the corresponding reference distribution has been considered. Given all past observations on individual height and the history of dropping below the reference quantile, which set of information is predictive for the occurrence of this event? Or, in other words, is the individual past pattern predictive? To encounter these questions, synthetic populations according to different dynamic specifications for individual height are generated. Then, the event that an individual observation is below the corresponding quantile at a specific time is defined. Probit regressions indicate the strong dependence of the predictive capability of past information on the underlying dynamic characterization of height. To analyze these questions further, empirical analysis of typical prevailing growth models is necessary, where current implementations have to be extended to deal with missing values in individual height, the time scale of the observed data.

Michael Hermanussen questioned current concepts of screening in short children with idiopathic growth hormone deficiency (iGHD). He presented clinical decisions following 2104 routine height measurements of 100 short boys and 49 short girls before being diagnosed and treated for iGHD. I.e. in these children the clinical decision: *what shall we do with the short child?* was made at a time when in the doctors' eyes, the children just appeared asymptomatic short. Two alternate decisions were distinguished: **1.** diagnostics and growth hormone (GH) treatment started within 6 months after the measurement (immediate decision); or **2.** GH treatment started later (delayed decision). In case of delayed decisions, also the lag period was determined between each measurement and that moment the child had first been "trapped as a short child", i.e. when the child had first dropped below the 3rd centile for height (potential growth failure). **Figure 4** illustrates the 2104 clinical decisions. Black triangles indicate immediate decisions; grey dots indicate delayed decisions. The X-axis shows height SDS. The Y-axis indicates the lag period between each measurement and the moment the child had first been trapped as a short child. The Figure illustrates that at a time when decision-makers are not yet aware that a child suffers from iGHD, there is no evidence for any non-random pattern in the clinical decision to start diagnostics/treatments. Even very short children with iGHD were not preferentially diagnosed. The lag time between first being trapped as a short child and the clinical decision to diagnose and treat, extended up to 9 years. Girls with iGHD have a 50% reduced chance to be detected and treated with growth hormone. As long as the decision-makers are not aware of later diagnoses it appears that clinical decisions to diagnose and treat children with iGHD do not significantly differ from random, in spite of numerous guidelines to manage the diagnostic work-up of children with short stature.

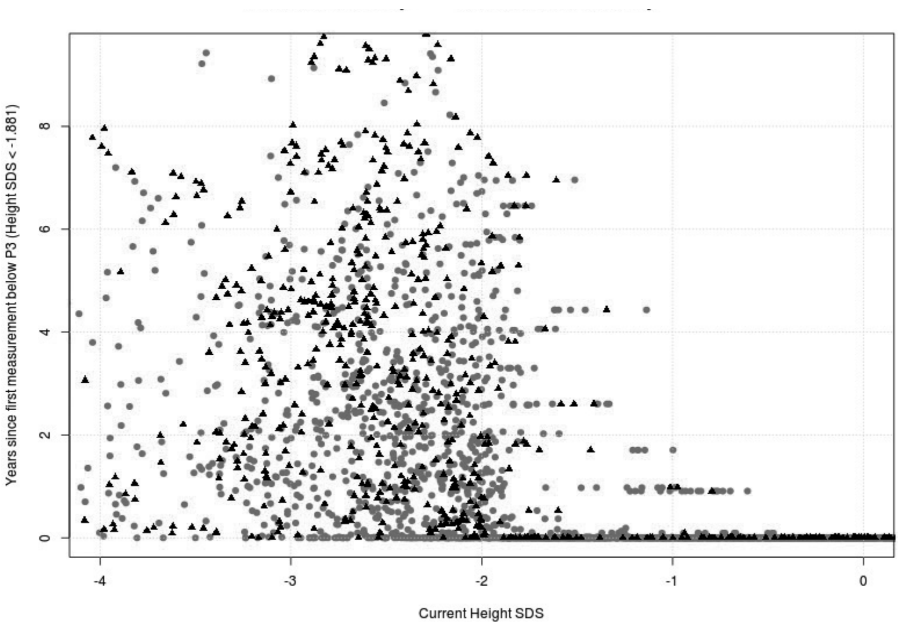

Figure 4. 2104 clinical decisions regarding: what shall we do with the short child? in 149 children with idiopathic growth hormone deficiency. Black triangles indicate immediate decisions; grey dots indicate delayed decisions. The X-axis indicates height SDS of the measurement. The Y-axis indicates the lag time between the moment a child had first been "trapped as a short child" and the clinical decision to diagnose and treat.

Detlef Groth, presented recent computer simulations of Swiss conscript height data. Recent evidence suggests that social networks play an important role in the regulation of adolescent growth and adult height. Based on an idealized geographic network of Switzerland with 169 nodes (district capitals) and 335 edges (connecting roads), the effects of connectedness on height in Swiss conscript from 1884–1891, 1908–1910, and 2004–2009 had been studied in a random network analyses. Direct road effects on height were only visible in all three historic conscript cohorts. The spatial correlations did not significantly change when height was controlled for goitre (1884–1889) and for median per capita income (2006), suggesting psycho-biological effects to control growth and development within communities that go beyond our current understanding of growth regulation (26). Groth further investigated the effect of physical connectedness on height with particular emphasis on heteroskedasticity of the height distribution, and presented possibilities to simulate genetic effects on height. First results obtained from random modelling of next generation conscript sizes suggest that the community effect on growth, as can be seen by height clustering in certain areas, does not need to depend on factors as illness or genetics.

Koichi Nariyama, Michael Hermanussen, Werner F. Blum, Maike Schäfer and Barry Bogin for the first time investigated individual series of serum IGF 1 levels in athletes during the Japanese ISKA Muay Thai World Super Feather Weight Championship to study possible psychological effects on the IGF 1 regulation in winning and loosing athletes. Capillary blood samples were collected by the athletes themselves on filter paper. Figure 5 illustrates IGF 1 serum levels in blood spots of one representative athlete before and after losing a Super Feather Weight Championship match. Preliminary data suggest that IGF 1 is influenced by psychological circumstances with an overall increase in sportsmen after sport matches. It was discussed to what extent the distinct weight manipulations before the sport matches might interfere with IGF 1 serum levels.

Christof Meigen revisited a functional data analysis approach for height in the face of massive sensor data. The Rhineland Study is currently prepared at the German Centre for Neurodegenerative Diseases in Bonn. This is a prospective cohort study which aims to follow 30 thousand participants over 30 years, with 7 hours of examinations every three years. The aim is to make raw data of all examinations available for analysis, i.e. there would not only be a few values, but thousands or even millions of data points as measurement results from various medical devices. The study is a good opportunity to revisit the experience we had years ago when working with assessing the normality of a child's growth from many randomly obtained height measurements. We analyzed standardized longitudinal data using principal component analysis to come up with components (functions of time respective age), so that height, as a function of time, can be expressed as:

$$h(t)=m(t) + \alpha_1 c_1(t) + \alpha_2 c_2(t) + \alpha_3 c_3(t) \ldots + \varepsilon(t)$$

where the mean function m(t), component functions c_1, c_2 etc. are constant in a population, and only the coefficients α_1, α_2 etc. are used to describe the individual growth pattern. Distributions of these coefficients in the population are known from the standardized longitudinal data. Given any set of height measurements (h_1, t_1), (h_2, t_2) etc we can apply the maximum likelihood principle to obtain the most likely coefficients α_1, α_2, etc. by maximizing the combined probabilities of the coefficients, and the differences between the calculated height function and the actual measurements, when viewing those differences as measurement errors. This technique gives a very stable guess for both the complete growth curve, as well as the likelihood of such a curve. Later on we explicitly corrected for different developmental velocities, and also applied these techniques to the analysis of face contours. In the latter case, we had to resort to manual landmark registration to not misclassify an upper lip as a nose, for example. Additionally, optimisation was more complex and fragile.

In summary, classification of certain curve features proved error-prone and needed expert supervision, but classification

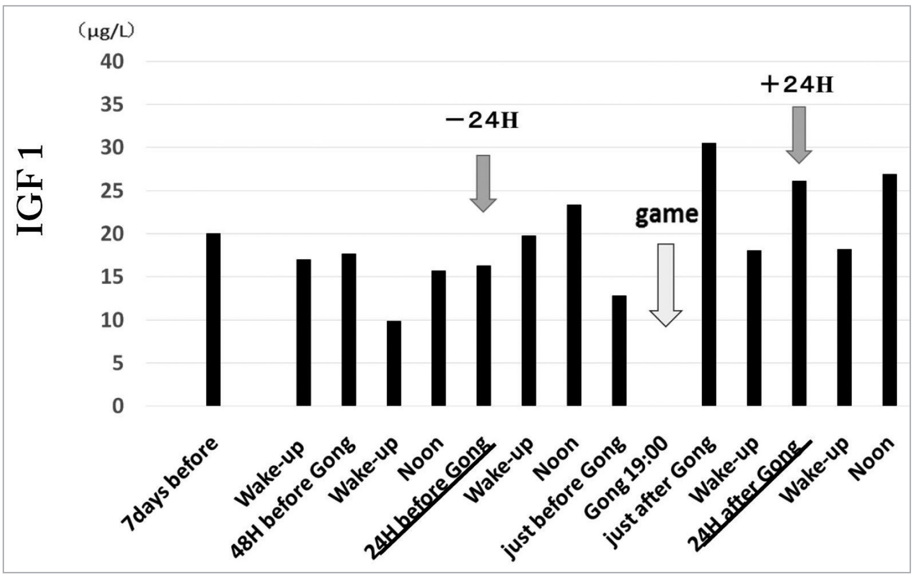

Figure 5. IGF 1 levels in blood spots of one representative athlete obtained before and after losing a Super Feather Weight Championship match. For comparison with serum samples IGF 1 levels need to be multiplied by 4.2.

of incomplete datasets as normal/not normal was very stable using the method described above. Given the extreme cost-effectiveness of obtaining lots of data by various sensors, we assume that techniques to quickly assess the normality of such data will become more important. Currently, the algorithms to do so are often hidden in the manufacturer's software, and of varying quality. It should be a focus of research not to rely on the output of theses devices, but to establish standard techniques to reliably evaluate the raw data.

Stef van Buuren discussed approaches to predict individual growth through curve matching. The idea is to create a method for predicting individual child growth that builds on familiar tools, portrays uncertainty in a natural way, uses past data in a new way, indicates the effect of treatment, is statistically correct, and obtains appropriate matches. The method tries to integrate the different aspects and questions that are asked by health professionals, or by parents or by insurance companies and policy makers.

Whereas health professionals are interested in: **1.** given what I know of the child, how will it develop in the future? **2.** how certain am I of the child's future growth? **3.** if I do not intervene, will development be normal? **4.** if I do intervene, will the child's growth be normal, or healthy? parents usually ask: **1.** what can be done to counter my child's inhibited growth? **2.** what is the prognosis if we do nothing? **3.** how certain is this prognosis? and insurance companies and policy makers are interested in whether the child gets the most effective treatment. For such an approach large donor data set with longitudinal growth curves are necessary to find those donors whose predicted value is closest to that of the target child. A small survey among prospective users (n = 105) showed that some 80% see added value on the tool; some 87% think that the tool should be available in the regular child health record; some 73% would consider using the tool once it is available; and some 43 would be willing to cooperate in building the donor data. In fact, curve matching may enhance a familiar tool, the growth chart; it matches real growth of real children; it provides a natural visualization of predictive uncertainty; it extends capabilities of health professionals; and appears to be an intelligent re-use of ‚old' clinical data, linked to local data bases (27). Yet reservations exist: growth is too variable during the first years of life; many parents are not (yet) open to this kind of information; tools do not account for temporary factors affecting growth; there may be the risk of over-interpretation.

Mona Abbas Elhusseini and Mortada Hassan El-Shabrawi presented data on Vitamin D (VD) deficiency (gathered by the collaborators: Nihal Mohamed El Rifai, Ghada Abdel Fattah Abdel Moety, Hassan Mostafa Gaafar and Dalia Ahmed Hamed) in healthy pregnant Egyptian women carrying a singleton full-term newborn (37 weeks' gestation) who did not receive any form of calcium or vitamin D supplementation during the last 3 months of pregnancy mothers and their neonates. 135 pregnant women attending the delivery unit of Kasr Al Ainy teaching hospital, Cairo University, and their newborns were included in this cross sectional observational study. More than 50% of the study participants had a low educational level. 86.7% of the study participants were veiled. 42.2% of the study participants were overweight and 48% were obese. The mean maternal serum of 25(OH)D3 was 32.6 ng/ml (range 3–82 ng/ml). The mean neonatal 25(OH)D3 was 16.7 ng/ml with about 50% difference between maternal and neonatal values.

Of all women, 54 (40%) were VD-deficient, 39 (28.9%) were VD insufficient and less than one-third (31.1%) had sufficient VD levels. Whereas 81 neonates (60%) had VD deficiency, 44 neonates (32.6%) had VD insufficiency, and only 10 neonates (7.4%) had sufficient VD levels. In 12 mothers (8.9%) and 24 neonates (17.8%), hypocalcemia was encountered. Of the hypocalcemic newborns, 9 (37.5%) presented with symptoms of hypocalcemia in the form of seizures (3 neonates), apnoea and cyanosis (6 neonates). Maternal serum VD and serum calcium strongly correlated with neonatal levels ($p<0.0001$). Neonatal VD was strongly correlated with neonatal calcium level ($r=0.919$, $p<0.0001$).

Maternal VD levels showed strong inverse correlations with both maternal and neonatal alkaline phosphatase levels ($p<0.0001$, respectively $p<0.0001$). Among the newborns of mothers who had VD deficiency, VD concentrations were significantly lower than newborns of mothers with VD sufficient levels (8.5 ng/ml versus 24.3ng/ml) ($p<0.0001$). Maternal VD deficiency was significantly more prevalent among pregnant women residing in rural areas (61.8%) than among those residing in urban areas (17.9%) ($p=0.024$). The current study revealed that over two thirds (68.9%) of mothers and 92.6% of their neonates had VD deficiency or insufficiency. The authors concluded that maternal VD deficiency is a problem in Egypt and warrants public health intervention.

Takashi Satake presented his work on individual variation in body proportion by the Body Proportion Chart. Twelve consecutive yearly measurements were obtained from 520 healthy, Japanese boys and 306 girls, born between 1980 and 1986, from 1st grade elementary to 3rd grade high school. Measurements included stature, sitting height, and lower limb length (subtracting sitting height from stature). LUR was calculated as lower limb length/sitting height x 100. Peak height velocity of LUR was significantly earlier than peak height velocity of stature with 9.9, respectively 12.9 years (LUR, respectively stature in boys) and 9.1, respectively 10.8 years (LUR, respectively stature in girls). There is marked inter-individual variation in the sequence of peak height velocity of LUR and stature, the correlation between the ages at PHV of LUR and stature is low.

Andrej Suchomlinov discussed the link between physiological neonatal weight loss and BMI in later life. Healthy full-term infants are expected to loose weight between 1st and 5th day after birth. Though weight loss in breastfed neonates usually ranges between 3.2 and 9.9% (mean 7%), some newborns do not experience weight loss, some even gain weight (28). Data from personal health records of 734 children were analyzed (396 boys and 338 girls, "Centro" out-patient clinic, Vilnius city); 238 children were born in 1990 (124 boys and 114 girls); 496 children were born in 1996 (272 boys and 224 girls). Only healthy, full-term and breast-fed infants who left a maternity unit during the first 14 days were included in the study. Birth weight, weight at leaving the maternity unit, and height and weight measured at annual intervals up to the age of 17 years were recorded. Infants left the maternity unit on day 4.62±2.33 and had lost an average 101.85±133.34g (or 2.77±3.74% of birth weight). No differences were observed between boys and girls. Nineteen boys (6.57%) and 25 girls (10.37%) did either not loose or even gained weight before leaving maternity unit. Whereas in boys, no statistically significant differences were detected between early weight changes and later growth, girls who did not loose, or even gained weight immediately after birth, tended to remain smaller and lighter during childhood and adolescents. Girls who lost weight after birth, had already been heavier at birth (3490 vs. 3163g), and remained heavier from the age of 5 years (with 60.6 vs. 54.3 kg at age 17 years, $p<0.01$). Girls who lost weight after birth were also taller than those who did not loose, or gained weight after birth (with 168.6 vs. 164.3 cm at age 17 years, $p<0.01$). The reasons for the interaction between early changes in infants weight and later weight and height remain to be elucidated.

Jan-Maarten Wit discussed the assessment of linear growth of children in low- and middle-income countries (LMICs), and summarized pros and cons of various indicators of growth, in view of projects on the identification of novel biomarkers of environmental enteropathy. Various indicators have been used in LMICs, such as HAZ as a continuous variable, HAZ as categorical variable, conditional HAZ (height for age z-score), change of HAZ, parametric growth models, and Z-scores of height velocity. It was concluded that best practices for growth indicator selection for most studies would be to perform descriptive analysis of HAZ (mean, SD) and median, to calculate proportion of stunted individuals (preferably >2 categories), to draw curvilinear regressions of biomarkers with HAZ (continuous and categorical), and if birth weight is known, to use conditional height as indicator of postnatal growth. In case 2 measurements (>2 months apart) are available, ΔHAZ and conditional height are suggested; in case of >2 measurements (> 2 months apart) ΔHAZ over 3-6 months, conditional height and random-effects regression models are recommended.

Cherie Yestrebsky provided an overview of K-12 school health screenings in the United States; national guidelines, state practices and comparisons to state-by-state toxic release inventory data. According to the National Association of State Boards of Education, 39 states have a vision and/or hearing screening requirement: 35 in-school, 4 parent responsibility (29). It is recommended that all children be screened for detectable vision problems between the ages of 3-5. School-based screening for hearing is currently required in 34/51 (67%) states + D.C. United States school-based hearing screens vary significantly. They focus on low frequencies with few testing adolescents for whom high-frequency hearing loss has increased (30). In some states these screening tests are mandated by law and may also include: dental checks, scoliosis evaluations, blood pressure readings, blood lead screenings, drug abuse, asthma, height and weight measurements. (The U.S. has no overarching regulations or law requiring schools to screen children for any kind of health issue.) Each individual state determines the screenings required for their K-12 schools and who will pay for it. 13 states require student body mass index (BMI). Of those 13, three states require that students have physical health screening outside of school. From 1980 to 2012, the percentage of youth who were obese increased from 7% to nearly 18% in children (6-11years) and 5% to nearly 21% in adolescents (12-19 years). 17.4% of children in U.S. are obese (31).

Yet, several sources argue that screenings produce too many false positives costing scarce money to be spent without need. Even when the child is correctly identified as needing help, there is no follow-up to verify the child receives further clinical evaluation. Very little data has been gathered on effectiveness (32). Arkansas evaluated the impact of its multicomponent, childhood obesity program that includes a statewide BMI-screening and -surveillance program. The percentage of Arkansas students classified as obese was 20.8% in 2003–2004, the first year of implementation, and remained 20.5% in 2007–2008 (33) bringing into question the effectiveness of such programs.

It is not clear whether states that screen more are also more concerned about toxic chemicals released to the environment. One tool for comparison is the Toxic Release Inventory (TRI) that tracks the management of certain toxic chemicals that may pose a threat to human health and the environment (34). This program covers 683 chemicals and chemical categories regarding cancer or other chronic human health effects, significant adverse acute human health effects, and significant adverse environmental effects (35).

Ursula Witwer-Backofen presented the project: Anthropology in Global Urban Health, of the Freiburg University that focuses on rapid environmental changes, on the interaction of environmental and genetic factors, on the polarisations of living conditions which may be an advantage for a small population subgroup but a disadvantage for the population at large, and on the interaction of infectious and non-communicable diseases. Interdisciplinary linkages are planned to evolutionary anthropology, environmental health, prevention, mental health, and health economy; based on 3 rapidly growing model cities: Fortaleza/Brazil, Pune/India, and Cape Town/SA. Recommendations of intervention strategies will be developed with emphasis on prevention, dietary habits, and stress-related disorders. In the 3 model cities, environmental burden, psychosocial and biological risk factors will be described, local clusters of risk factors will be mapped and correlated with prevalence of diseases; and appropriate indicators of health development will be defined.

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