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BOOK OF ABSTRACTS

23rd EAA

23rd CONGRESS
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Anthropology in the Anthropocene:
Exploring Human Influences
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16th ISGA

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For issue vol.4, no. 2 in 2024. we were privileged for the opportunity to announce excellent scientific lectures to be presented at the Joint International Meeting 23rd EAA Congress, 16th ISGA Congress and SSHB Congress.



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BOOK OF ABSTRACTS

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ISGA



Joint International Meeting

23rd EAA Congress -16th ISGA Congress - SSHB Congress

BOOK OF ABSTRACTS

5th - 8th September 2024

**Venue: University of Zagreb, Faculty of Kinesiology,
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ABSTRACTS OF INVITED SPEAKERS





Presentation number: 01 (ISGA)

PERSISTENCE OF FETAL GROWTH EFFECTS ON POSTNATAL GROWTH IN GAMBIAN CHILDREN

Adair Linda¹, Prentice Andrew², Moore Sophie³

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We examined how changes in fetal size from 20 to 30 weeks' gestation relate to postnatal growth in Gambian children who were participants in the Early Nutrition and Immune Development (ENID) trial. Non-pregnant women (age 18-45 yr.) were identified through monthly surveillance, and those with a missed menstrual period and a positive pregnancy test were recruited prior to 20 weeks' gestation. At 20- and 30-weeks' gestation, fetal biparietal and occipitofrontal diameters, head circumference, abdominal circumference and femur and tibia length were measured by ultrasound. Estimated fetal weight (EFW) was calculated using the Intergrowth fetal biometry reference. Change in EFW and in femur length (FL) from 20 to 30 weeks was regressed on gestational age at 20 weeks, the interval from 20 to 30 weeks and infant sex. The standardized residuals from these models represent rate of fetal weight gain and linear growth, respectively and as residuals, are uncorrelated with size at 20 weeks. We then used longitudinal random effects models to see how fetal size and rate of growth were related to postnatal weight and length from birth to 24 months in 776 children with fetal measurements and at least one post birth measurement. Models included gestational age at delivery, child sex, dummy variables for study visit to represent non-linear effects of age, maternal height, primiparity, and education level. Results show persistent statistically significant associations of EFW at 20 weeks and weight gain from 20-30 weeks on postnatal weight and of FL and length gain from 20-30 weeks on postnatal linear growth. In addition, positive coefficients on the interaction of fetal measures with time show strengthening effects with child age. Additional analyses will identify the role of additional factors that predict fetal growth and birth outcomes. Overall, the results demonstrate the importance of fetal growth restriction as a persistent determinant of postnatal growth.

Keywords: Fetal growth, postnatal growth, growth restriction



Presentation number: 02 (ISGA)

LMS GROWTH CHARTS AND SITAR GROWTH CURVES – OLD DOGS AND NEW TRICKS

Cole Tim

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The distinguished auxologist James Tanner greatly advanced the field of human growth and development. He popularised the construction and use of growth charts – the 1966 Tanner-Whitehouse standards set a high bar for what came later. However, his way of constructing skew weight centiles was both subjective and time-consuming, until the LMS method (Cole and Green, 1992) simplified the process. Later GAMLSS (generalised additive models for location, scale and shape) (Rigby and Stasinopoulos, 2005) provided a flexible toolbox for fitting centiles to data. Growth charts ideally need a reference sample of 7000 or more (Cole, 2021) – a large number to find when working with syndromic conditions, and infeasible with gene-specific charts for monogenic neurodevelopment disorders where there may be fewer than 100 patients worldwide. The talk will describe a modification to the LMS method for very small samples. Called the LMSz method, it uses an existing baseline growth reference to transform the data to z-scores, then models them using GAMLSS assuming a Normal distribution with linear age trends in the mean and standard deviation, and then back-transforms the centiles. The LMSz method will be applied to example data for several different genes, in work with Dr Karen Low (Bristol University). Tanner also experimented with growth charts modified to handle the chaos of puberty, where growth tempo is very variable between individuals. Longitudinal data are essential here to obtain a full picture, and the SITAR method of Cole et al (2010) summarises individual growth curves in terms of final height, peak height velocity and age at peak velocity. However, just as with growth charts, weight is more complicated than height as it fails to plateau post-puberty – it keeps on rising. The talk will describe an extension to the SITAR method which models the post-growth period of the weight curve, in work with Dr Ahmed Elhakeem (Bristol University) with examples from large cohort studies.

Keywords: growth charts; growth curves; LMS method; SITAR model



Presentation number: 03 (EAA)

TRACING ANCIENT HISTORIES: FROM DIET TO MEDICINE THROUGH DENTAL CALCULUS

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In the last decade, the analysis of ancient dental calculus has become a powerful tool for studying prehistoric and historical diets, lifestyles, and health practices. This calcified biofilm on teeth preserves dietary particles, plant phytoliths, microbial DNA, and therapeutic compounds, providing insights into the daily lives and socio-economic conditions of ancient populations. Initially focused on diet, this research has recently expanded to encompass broader issues such as human evolution, trade, health impacts, and contributions to historical knowledge.

Recent advancements in biomolecular techniques, such as high-resolution microscopy and DNA sequencing, have enabled the identification of plants used as dietary staples before agriculture and as medicinal herbs, revealing intricate details of human life over millennia. Studies have uncovered the presence of β -lactoglobulin, a milk protein, in dental calculus from Neolithic sites, offering some of the earliest direct evidence of dairy consumption. Exotic substances such as turmeric, ginger, and other spices found in dental calculus provide evidence of ancient trade routes and cultural exchanges in protohistoric and historical times. Beyond dietary reconstruction, dental calculus has also contributed to recognizing hidden aspects of ancient history. For example, the presence of lapis lazuli in the dental calculus of medieval nuns has recently highlighted the role of these women as some of the first female amanuenses in history.

From a multidisciplinary perspective, the analysis of dental calculus has become key in archaeological research to understand ancient socio-cultural practices and human-environmental interactions. This presentation will review the current state of dental calculus research, highlighting key findings that have advanced our understanding of historical diets and health. I will explore interdisciplinary approaches that combine archaeology, molecular biology, and forensic science to extract biographical information from dental calculus. Furthermore, I will discuss the potential applications of this research in understanding ancient medicinal practices, trade networks, and cultural interactions, along with future research directions emphasizing the need for standardized analytical techniques.

Additionally, I will present the project ROMAN CALCULUS – Ancient materia medica, modern therapeutic substances and drugs of abuse through dental calculus, which focuses on archaeological, clinical, and forensic disciplines for understanding medical care and lifestyles in ancient times. By comparing ancient and modern evidence, this project opens new avenues for research on ancient medical care.

Keywords: diet, medicine, dental calculus



Presentation number: 04 (ISGA)

CURVE MATCHING: A BIG DATA TECHNIQUE TO PREDICT GROWTH IN PATIENTS RECEIVING GROWTH HORMONE THERAPY

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Curve matching may be used to predict growth outcomes. To apply this method a longitudinal database is needed with a large amount of patients' longitudinal growth data that forms the basis of developing growth curves. This database can be used to identify growth curves (e.g. height) of patients that are similar to the growth curve of a new patient up until their current visit. The growth curves of these 'matched' patients can then be added to the growth chart of the new patient to visualize how this patient is expected to grow in the future. We aimed to investigate the validity of curve matching to predict growth in patients with growth hormone deficiency (GHD) and those born small for gestational age (SGA) receiving recombinant human growth hormone (r-hGH). Height data collected between 0–48 months of treatment were extracted from the easypod™ connect ecosystem and the easypod™ connect observational study. Selected patients with height standard deviation scores (HSDS) [-4, <-1] and age [3, <16y] at start were included. The 'Matching Database' consisted of patients' monthly HSDS obtained by the broken stick method and imputation. Standard deviation (SD) was obtained from the observed minus the predicted HSDS (error) based on matched patients within the 'Matching Database'. Data were available for 3,213 patients in the 'Matching Database', and 2,472 patients with 16,624 HSDS measurements in the observed database. When ≥ 2 HSDS measurements were available, the error SD for a one-year prediction was approximately 0.2, which corresponds to 1.1 cm, 1.3 cm, and 1.5 cm at 7, 11, and 15 years of age, respectively. We conclude that curve matching is a simple and valid technique for predicting growth in patients with GHD and those born SGA. The results are interpretable and explainable without adding significant workload to the clinical pathway.

Keywords: curve matching, growth disorders, growth hormone, prediction model, paediatric, growth hormone deficiency, small for gestational age



Presentation number: 05 (ISGA)

INFANT AND CHILDHOOD GROWTH DYNAMICS: MODELLING, PRENATAL CORRELATES, AND LIFE- COURSE OUTCOMES

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Childhood obesity rates have increased fourfold in the last three decades. Growth dynamics in infancy and childhood highlight early developmental processes driving the risk of increasing adiposity. Thus, it is important to characterize early life growth and identify its correlates and outcomes. I will use data from multiple population-based birth cohort studies to present some of my ongoing work in this area. I will first present a study comparing mixed effects models with the aim of identifying the best method for modelling infant to childhood growth curves, for the purpose of estimating growth curve features (BMI peak, rebound, and area under curve). I will then present two studies that investigate how birth weight for gestational age centiles and assisted reproductive technology conception associate with Infant and childhood growth dynamics. Finally, I will present a study that aims to examine how early life growth dynamics relate to long- term cardio-metabolic trajectories up to adulthood.

Keywords: Growth curves, P-splines, mixed effects, adiposity rebound



Presentation number: 06 (ISGA)

ASSOCIATIONS OF EARLY LIFE 'STUNTING' WITH COGNITIVE AND CARDIOMETABOLIC HEALTH IN SAMOAN CHILDREN

Hawley Nicola¹, Lupematisila Vaimoana², Soti-Ulberg Christina³, Naseri Take³, Duckham Rachel⁴, Choy Courtney¹

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In some settings, stunting in early childhood is associated with increased risk of later obesity-related cardiometabolic disease. In Samoa, where obesity prevalence is among the highest globally, few early life risk factors have been explored. We used longitudinal data from an ongoing mixed longitudinal cohort – the Ola Tuputupua'e (Growing Up) study, which collects data on ~500 families biannually, beginning at 2-4 years of age – to examine associations between stunting and mid-childhood cardiometabolic and cognitive health. Among n=246 children aged 5-11 years (48.4% female; measured in 2019) we examined differences in body mass index (BMI), blood pressure, glycated hemoglobin (HbA1c), and fluid intelligence based on the presence or absence of stunting four years earlier (age 1-5 years). Fluid intelligence was measured using the non-verbal Ravens Progressive Matrices test. Low height-for-age was present at age 1-5 years in 21.3% of boys and 16.8% of girls, but these cases of 'stunting' were likely a poor indicator of chronic malnutrition given healthy to high weight-for-age z-scores among the sample. Stunting had resolved in all but one child by 5-11 years. In boys, early childhood stunting was associated with lower BMI and marginally lower systolic blood pressure at age 5-11 years. In girls, stunting was associated with lower BMI, lower systolic and diastolic blood pressure, and lower Raven's ability scores. After adjusting for child height at the 5-11-year assessment, maternal height, maternal education, and household income in linear regression models, associations between stunting and BMI persisted across the whole sample; among girls, associations with diastolic blood pressure and fluid intelligence became non-significant, but the association with lower systolic blood pressure remained. In a sample of Samoan children at high risk for obesity-related cardiometabolic disease, stunting in early childhood was associated with a generally more favorable cardiometabolic profile in later childhood.

Keywords: early life stunting, cognitive health, cardiometabolic health, samoan children



Presentation number: 07 (ISGA)

EXPOSURE TO PER- AND POLYFLUOROALKYL SUBSTANCES AND TIMING OF PUBERTY IN NORWEGIAN BOYS: DATA FROM THE BERGEN GROWTH STUDY 2

Ingvild Halsør Forthun^{1,2}, Mathieu Roelants³, Helle Katrine Knutsen^{4,5}, Line Småstuen Haug^{4,5}, Nina Iszatt^{4,5}, Lawrence M. Schell⁶, Astanand⁸, Robert Bjerknes^{1,2}, Ninnie B. Oehme², Andre Madsen⁹, Ingvild Jugessur⁷, Særvold Bruserud², **Petur Benedikt Juliusson**^{1,2,10}

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Per- and polyfluoroalkyl substances (PFAS) are widespread environmental contaminants with endocrine-disruptive properties. Their impact on puberty in boys is unclear. In this cross-sectional study, we investigated the association between PFAS exposure and pubertal timing in 300 Norwegian boys (9-16 years), enrolled in the Bergen Growth Study 2 during 2016. We measured 19 PFAS in serum samples and used objective pubertal markers, including ultrasound-measured testicular volume (USTV), Tanner staging of pubic hair development, and serum levels of testosterone, luteinizing hormone, and follicle-stimulating hormone. In addition to logistic regression of single-pollutants and the sum of PFAS, Bayesian and elastic net regression were used to estimate the contribution of the individual PFAS. Higher levels of the sum of perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA) and perfluorohexanesulfonic acid (PFHxS) were associated with later pubertal onset according to USTV (age-adjusted odds ratio (AOR): 2.20, 95% confidence interval (CI): 1.29, 3.93), and testosterone level (AOR: 2.35, 95% CI: 1.34, 4.36). Bayesian modelling showed that higher levels of PFNA and PFHxS were associated with later pubertal onset by USTV, while higher levels of PFNA and perfluoroundecanoic acid (PFUnDA) were associated with later pubertal onset by testosterone level. Our findings indicate that certain PFAS associate with delay in male pubertal onset.

Keywords: Child; Adolescent; Endocrine disruption; Environmental health; Puberty



Presentation number: 08 (ISGA)

THE PROPORTION OF WEIGHT GAIN DUE TO CHANGE IN FAT MASS IN INFANTS WITH VS WITHOUT RAPID GROWTH

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Background There is extensive evidence that rapid infant weight gain increases the risk of childhood obesity, but this is normally based on childhood body mass index (BMI) only and whether or not this is because infants with rapid weight gain accrue greater fat mass is unknown. **Objective** The primary objective of our study was to test whether the proportion of infant weight gain due to concurrent increases in fat mass is greater in infants with rapid weight gain as compared to those with normal growth. **Methods** Body composition was assessed by 1) air-displacement plethysmography (ADP) at 0 & 6 months in 342 infants from Australia, India, and South Africa and 2) deuterium dilution (DD) at 3 & 24 months in 555 infants from Brazil, Pakistan, South Africa, and Sri Lanka. Weight gain and length growth were each categorized as slow, normal, or rapid using cut-offs of < -0.67 or $> +0.67$ Z-scores. Regression was used to estimate and contrast the percentages of weight change due to fat mass change. **Results** Approximately 40% of the average weight gain between 0-6 months and 20% of the average weight gain between 3-24 months was due to increase in fat mass. In both samples, compared to the normal group, the proportion of weight gain due to fat mass was higher on average among infants with rapid weight gain and lower among infants with slow weight gain, with considerable individual variability. Conversely, slow and rapid length growth was not associated with differential gains in fat mass. **Conclusions** Paediatricians should monitor infant growth with the understanding that, while crossing upward through the weight centiles generally is accompanied by greater adiposity gains (not just higher BMI), upward crossing through the length centiles is not.

Keywords: Rapid infant weight gain, infant growth, childhood obesity, body composition, growth monitoring



Presentation number: 09 (ISGA)

UNDERSTANDING THE COMMON AND RARE GENETIC BASIS OF BIRTHWEIGHT, CHILDHOOD GROWTH, AND PUBERTY

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Growth patterns in early life vary considerably in the population, have a significant heritable component, and are associated with a range of health outcomes in later life. To elucidate their underlying biological mechanisms, we conducted genetic association analyses for birthweight, childhood body size, and pubertal onset. We performed a multi-ancestry genome-wide association study (GWAS) in ~800,000 women, identifying >1000 independent signals associated with age at menarche. Women at the top and bottom 1% of polygenic risk exhibited ~11 and ~14-fold higher risk of delayed and precocious puberty, respectively. We delineated which pubertal signals may exert primary effects on growth, using longitudinal childhood growth data from birth to late childhood, in up to ~72,000 children. We identified body size dependent and independent biological pathways, implicated in pubertal timing. These common variant analyses were supported by exome sequence analyses of rare putative loss-of-function (LOF) variants in up to ~420,000 participants, which highlighted many of the GWAS identified genes but also novel genes and mechanisms. We identified 6 genes harbouring rare LOF variants that associate with pubertal onset, including *TACR3*, *MKRN3* and *MC3R*. We identified further components of the leptin-melanocortin pathway, where LOF was associated with increased childhood adiposity, *POMC* and *MC4R*, among other genes. LOF carriers of the gene *INHBE* reported simultaneously increased childhood adiposity and increased birthweight, alongside a propensity for favourable adiposity in adulthood. We also identified regulators of fetal adipose tissue; *ACVR1C* and *PPARG*, fetoplacental angiogenesis; *NOS3* and *NRK*, and insulin-like growth factors; *IGF1R* and *PAPPA2*, as determinants of birth weight. These findings extend our understanding of the biological complexity of early growth and pubertal timing and demonstrate how common genetic variants can often influence the clinical extremes.

Keywords: GWAS; exome sequencing; rare variants; puberty; menarche; birthweight; childhood growth; fetal development; BMI; obesity



Presentation number: 10 (EAA)

DIFFICULTIES IN FORENSIC DENTAL AGE ESTIMATION FROM DEVELOPING TEETH

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The aim of this study was to highlight difficulties in dental age estimation based on developing permanent teeth. Individual forensic age estimation represents valuable information for the legal authorities upon which they make decisions that affect one's rights. The forensic odontologist who conducts the individual age estimation should always provide complete information regarding the accuracy of a particular dental age estimation method to the legal authorities. Herein lies the first problem; most published studies report the performance of different dental maturity reference data/methods as a single value, despite differing age range, structure and statistical approach. The second difficulty is that tooth formation is divided into qualitative, descriptive stages that are discrete events in a continuous process. The reliability of stage assessment is crucial as a one stage difference effects the dental age. Another challenge is the inappropriate use of Demirjian, Goldstein and Tanner (1973) dental maturity method, never designed to estimate age. These issues will be illustrated and discussed with a view to improve how forensic dental age estimation for an individual is reported and explained in light of individual variation.

Keywords: age estimation, developing teeth



Presentation number: 11 (ISGA)

DENTAL BIORHYTHMS AND HUMAN GROWTH

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Teeth retain evidence of biological cycles. One of these cycles is preserved in the form of layered enamel. Studies report an association between the timing of enamel layers measured in days (layer periodicity: LP) and adult body mass across primates. Accumulating evidence suggests these layers may form in response to an underlying biorhythm that temporarily modifies enamel formation and acts upon the hypothalamus to regulate cell growth and body mass. The relationship of this biorhythm to human growth is poorly understood though it appears to be person-specific with a periodicity that ranges between 5 to 12 days. To further our understanding, the Biorhythm of Growth study was established in New Zealand (NZ) and the United Kingdom (UK) between 2018 and 2023. In the first stage of data collection, we observed modal LP's differed between males and females. The biorhythm could change within an individual in relation to periods of non-specific systemic stress but otherwise LP remained constant within molars. The next stage of data collection investigated LP related to weight gain and BMI during early adolescence. Measurements were recorded every 4 weeks for 14 months for n=125 New Zealand-European, Māori and Pacific Island male and female participants (mean starting age=10.3 years) in NZ. Their naturally exfoliated milk molars were collected and two matching LP's were calculated for a subset of n=61, using histological methods in the UK. Analyses accounted for sex differences in growth trajectories, maturation stage, ancestry, and a Covid-19 national lockdown. We observed that within the sexes, those with an LP of 5 or 6-days gained less weight and had a smaller change in their BMI over 14 months compared to those with a 7 or 8-day periodicity. A BMI above the 95th percentile associated with a higher periodicity. This presentation focuses on what we have learned so far about this biorhythm in relation to human growth. Our next research steps will be outlined.

Keywords: child cohort, weight gain, obesity, adolescence, dental histology



Presentation number: 12 (ISGA)

SHORT HEIGHT-FOR-AGE: SHOULD WE THINK OF IT AS A DEFICIT, A DELAY, OR A BIT OF BOTH?

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Stunting, growth faltering, and short height-for-age are all terms used to describe linear growth that falls below set thresholds on growth standards. Many studies continue to investigate the causes and consequences of malnutrition and short height in children globally, yet the conversation surrounding what short height-for-age represents biologically has mostly died down. This talk discusses some recent developments in our understanding of the biological and conceptual underpinnings of 'stunting' using evidence from Demographic and Health Surveys and a longitudinal cohort study from Guatemala, which also includes detail on the children's bone age (bone maturation). Does a delay in bone growth explain the observed height deficits, as suggested by a recent revival of the concept of 'height-age'? Are there observable differences between the sexes, or related to the severity of the nutritional insults? What about weight? The final part of the talk encourages colleagues to contribute to the conversation by welcoming their expert insights.

Keywords: growth; stunting; height-age



Presentation number: 13 (EAA)

ASPECTS OF THE GENETIC MAKINGS OF NORTHEAST EUROPE

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It has been well established that postglacial peopling of Europe has involved three major demic expansions. Hunter-gatherers (HG) and early agriculturalists both from West Asia and pastoralists from the Pontic steppe. In addition, there is a more easterly influence in NE Europe detected in the Iron Age. Here we refine this broad narrative in NE Europe. We first explore the dynamics of western and eastern HGs in the Baltics, suggesting more genetic connections between people associated with different cultures/periods than previously thought. Then we document both abrupt and continuous patterns of genetic change during and after adoption of agriculture in the northern East European Plain. A genetic change with the arrival of steppe ancestry can be seen all over the region, whereas later changes are more subtle and region-specific. We will also take the example of Uralic language family to explore if languages and genes walk the same path. Finally, we explore patterns of genetic sharing between Estonians and Finns using large scale biobank datasets and novel methods. Despite substantive differentiation in allele frequencies, the two populations sport unexpectedly many segments of long shared allele intervals dating roughly to around 5th/6th century AD. This shows the importance of relatively recent events for the formation of contemporary populations.

Keywords: population genetics, Northeast Europe, demic expansions



Presentation number: 14 (EAA)

SEVERE OBESITY IN SCHOOL-AGED CHILDREN IN CROATIA – AN EPIDEMIOLOGICAL PERSPECTIVE

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Croatia joined the World Health Organization (WHO) European Childhood Obesity Surveillance Initiative (COSI) in 2015 to estimate prevalence and monitor changes in overweight and obesity in children aged 8 years. Since then, there have been three rounds of data collection in Croatia involving more than 16 thousand children. The aim of this work was to present the prevalence of severe obesity in 8-year-old children from Croatia using COSI data. The data are from cross-sectional studies in Croatia that were carried out as the first three CroCOSI rounds of data collection (2015/2016, 2018/2019, 2021/2022). School-aged children were measured using standardized instruments and methodology. Children were classified as having severe obesity using the definitions provided by WHO and the International Obesity Task Force (IOTF). Analyses over time and parental educational level, were also performed. In 2022, the prevalence of severe obesity varied greatly among regions. According to the WHO definition, severe obesity ranged from 1.3% in City of Zagreb (95% CI 0.6–2.6) to 5.3% (95% CI 3.6–7.7) in Pannonian Croatia. The prevalence was generally higher among boys compared to girls. The IOTF cut-offs lead to lower estimates, but confirm the differences among regions, and were more similar for both boys and girls. In the Adriatic and Pannonian regions 1 in 4 children with obesity have severe obesity. Applying the estimates of prevalence based on the WHO definition to the whole population of children aged 8 years in Croatia, around 1,200 children would be expected to have severe obesity in Croatia. Severe obesity was more common among children whose parental educational level was lower. The trend between 2015 and 2022 did not show a clear pattern. Severe obesity is a serious public health issue which affects a large number of children in Croatia. Because of the impact on educational, health, social care, and economic systems, obesity needs to be addressed via a range of approaches from early prevention of overweight and obesity to treatment of those who need it.

Keywords: Obesity, BMI, Childhood Obesity Surveillance Initiative, Croatia



Presentation number: 15 (EAA)

ENTERING THE UNDERWORLD: BIOARCHAEOLOGY OF THE LATE ROMAN PERIOD BURIALS FROM OZALJ CAVE, CONTINENTAL CROATIA

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The paper aims to present the results of a combination of (bio)archaeological, genomic and isotopic analyses conducted on the remains of individuals buried in Ozalj Cave, located on the outskirts of the town of Ozalj in continental Croatia. The recent excavations conducted in the cave revealed the presence of the remains of several individuals dated to 3rd c. CE based on direct radiocarbon dating. The remains of at least one adult and two subadults show several pathological changes indicating intense physical work, poor subadult health as well as poor oral health. The ongoing carbon and nitrogen isotopic studies will reconstruct the everyday diet of these people, while genomic analysis will tell us more about their genetic ancestry, molecular sex as well as possible kinship. And finally, the individuals from Ozalj Cave will be compared with other contemporaneous individuals from a wider region buried in a similar manner.

Keywords: Roman period, bioarcheology, stable isotopes, paleopathology, aDNA



Presentation number: 16 (EAA)

FROM INEQUALITY TO FUTURE WELLBEING: UNLOCKING HUMAN FLOURISHING AND PLANETARY HEALTH

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To safeguard our planet and guarantee wellbeing for all, we must drastically reduce inequality and fundamentally transform our economic objectives. Large income and wealth differences – both within and between countries – reduce the chances that our societies can respond adequately to the environmental crisis and ensure the health of both people and planet. Moulding a sustainable future requires changes that are much more profound than simply transitioning from fossil fuels to renewable energy resources. The scale of inequality has profound effects on our ability to navigate these challenges. It also sets necessary conditions on what a sustainable society should look like, and, above all, on whether we are willing to make the changes required to get there.

Keywords: inequality, sustainability, planetary health



Presentation number: 17 (EAA)

BODY HEIGHT AS A MIRROR OF SOCIAL STATUS AND STATE OF INTEGRATION IN MIGRANT POPULATIONS

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Background: Body height of migrants differs to body height in their countries of origin, sometimes they are taller sometimes shorter. In contrast to the general understanding genetic, nutrition and public health do not play an essential role in the regulation of growth, and in the case of migrants it does not provide an argument to explain the discrepant body height adjustment. But regulation of growth depends on social environment. Aim: We want to test the hypotheses that body height of migrants is strongly influenced by the perceived integration of migrants themselves. Sample and Method: We describe the socio-endocrine regulation of human growth with the transmitter-receiver-model to explain the differences in height of migrants comparable to the body height in host communities and countries of origin. We used data of recent and historic migrant populations. Results: Comparable to the peer-group well-integrated (e.g., in education, culture) migrants are tall; migrants of not well integrated groups are short. Also, migrants without sense of belonging to the new social host group are short. Whereas children of migrated colonial masters as members of a dominant group are tall. Conclusion: Through the mechanism of endocrine- regulated strategic growth, the target size during adolescence adjusts to the perceived social status in a community. This depends on the individual's perception of his or her status in society and the social acceptance of that status in society.

Keywords: Migrants, body height, socio-economic-political-emotional factors



Presentation number: 18 (EAA)

POPULATION MOBILITY AND CLIMATE CHANGE: IMPLICATIONS FOR PUBLIC HEALTH

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Extreme weather events such as heat waves, drought, heavy rainfall, floods, hurricanes, and tornadoes are associated with climate change and can result in population displacement. Additionally, the decrease in land productivity and habitability, along with diminished food and water security due to climate change, can intersect with various demographic, economic, and social factors to drive population mobility and migration with implications for population health. Migrants may be more susceptible to both communicable and non-communicable diseases due to changing climatic conditions in their home countries, their destinations, or during their migration journey. While migration has not yet been a major factor in communicable disease outbreaks, it is essential for public health authorities to implement effective screening and vaccination programs for priority diseases.

The rise in population, coupled with socio-economic development, is boosting travel and tourism. Moreover, technological advancements have enhanced global connectivity, shortening travel times. Thus, travel and tourism can contribute to disease dispersion of tropical diseases to temperate regions of the world, where climate change has created suitable conditions for transmission. Many temperate regions, including high-income countries, are now more hospitable to vector-borne diseases. This increases the risk of importing vectors and pathogens from endemic areas, potentially leading to outbreaks of diseases that local health professionals may not be familiar with.

Health systems must be equipped to handle the potential public health impacts of migration, travel, and tourism, and the broader effects of climate change. Integrated surveillance, early case detection, and other public health measures are vital to safeguard public health and prevent and control communicable disease outbreaks.

Keywords: population mobility, climate, health



Presentation number: 19 (EAA)

THE EMERGENCE OF HUMAN SOCIETIES WITH NATURAL LANGUAGE

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Some people hold the view that the origin of natural language is the hardest problem of science. While there are some other rival problems, the emergence of natural language remains an open problem. Arguably, the origin of language was a major evolutionary transition that had its biological and social foundations. Language provided a novel inheritance mechanism and led to symbolic cultural evolution. I shall put language in the context of the human-specific adaptive suite that includes a complex theory of mind, efficient teaching, analogical reasoning, shared attention and computation, and advanced tool making and use. Protolanguage is thought to have appeared in *Homo erectus* in the confrontational scavenging niche, while the full syntactic capacity is likely to have appeared in *Homo sapiens*. Finally, I shall attempt to look at some interesting positive and negative consequences of the AI revolution.

Keywords: language, major evolutionary transitions, protolanguage, cultural evolution, symbols



Presentation number: 20 (ISGA)

BIOLOGICAL DETERMINANTS OF INDOOR AIR POLLUTION AND IT'S RELATION TO CHILD HEALTH

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People in developed countries spend up to 90% of their time indoors and indoor air pollution has been recognized as an emerging health threat. The most common sources of pollutants of indoor air include volatile organic compounds, carbon monoxide and dioxide, indoor combustion, tobacco smoke, as well as biological sources of pollutants such as moulds, bacteria and other allergens. In their homes, people are exposed to a large number of microbes which can have important implications for their health. Within the EDIAQI project, the main sources and composition of biological determinants of indoor air pollution have been analysed, as well as the link between the exposure to microorganisms and health-related outcomes. 200 dust samples from homes of asthma patients aged 6-18 years have been collected and analysed to retrieve dust microbiome data (the diversity and quantity of bacteria and fungi) by sequencing on the Illumina MiSeq platform. Obtained genetic results have been associated with medical and other health-related data and the analysis gave support to the current findings in the field. Namely, higher microbial diversity in the environment has been shown to be inversely associated with asthma and the most prominent environmental factors affecting the house dust microbiome are living conditions (such as moisture), level of urbanization, season, pets and number of children in the family.

Keywords: indoor air pollution, dust microbiome, child health



Presentation number: 21 (EAA)

AGE AT MENOPAUSE IN RELATION TO SOCIOECONOMIC AND GENERAL HEALTH STATUS INDICATORS: A MULTIFACTORIAL ANALYSIS OF DATA FROM DIFFERENT COUNTRIES AND EVOLUTIONARY APPROACH

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Background and Objectives. Only female humans and a few species of whales go through menopause (MP). Why and what is the biological meaning of this phenomenon, which risks may be associated with early or late MP? Menopauses vary worldwide and is related to many biological and extrinsic factors. The aim of this study was to analyse global variation of MP age in relation to socioeconomic and general health status indicators, and to provide an evolutionary perspective on MP age variation. **Material and Methods:** Data on age at MP during the last decade were analysed in 45 countries using 36 literature sources. The MP age of the Lithuanian population was calculated using the data of 2019-2023 (880 women aged 40 to 60). Socioeconomic and general health status indicators of the included countries were taken from officially available statistical data websites. Factor analysis was applied to reveal potential factors associated with global variation of MP age. **Results:** Globally, the average age of MP in the analysed countries was 48.6 years ($SD \pm 2.01$; Min-Max = 45.3-52.3 years). As for Lithuania, MP age was 49.6 ($SD \pm 4.4$) years. Factor analysis showed that MP is a multifaceted phenomenon that was mostly associated with general well-being indicators (GDP, life expectancy, etc.), also with many diseases that are common in developed societies today (in particular, hypertensive and ischemic heart diseases, polycystic ovary syndrome, various cancers). In addition, geographic issues were also partially related to MP age. Evolutionary theories to explain variations in MP age will be presented. **Conclusions:** The earliest menopause was found in countries with a sunny and warm climate. On the other hand, these countries are less advanced economically. The complex relationships between late menopause, various socioeconomic factors, and diseases need to be explored on the individual level as well in order to better understand the multifaceted structure of this phenomenon.

Keywords: Age at menopausal, global variation, general health status, socioeconomic factors, factor analysis



Presentation number: 22 (ISGA)

DEVELOPMENT OF PEAK BONE MASS: FINDINGS FROM THE NICHD BONE MINERAL DENSITY IN CHILDHOOD STUDY

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The development of peak bone mass closely follows the growth of the skeleton, but not exactly. Optimizing peak bone mass is important to prevent or delay the onset of osteoporosis later in life and also has implications for bone strength during childhood. Reference ranges for bone mineral density (BMD) are critical for interpretation of measurements by dual energy X-ray absorptiometry and paediatric bone health assessment because of the age, sex and puberty associated changes in bone accrual. However, it is unclear how to incorporate related factors, such as size, body composition and racial background into bone health assessment. Using data from the NICHD Bone Mineral Density in Childhood Study (BMDCS), a multi-centre, multi-ethnic, mixed-longitudinal, observational cohort study of over 2,000 children, the effects of height, lean mass, pubertal development and racial background will be examined. Findings show that the association of height status (height for age Z-score) with BMD Z-scores vary as a function of age and are strongest during the ages of rapid pubertal development. Although puberty stage is a statistically significant predictor of BMD Z-score, there is large overlap between puberty stage groups, so its value in bone health interpretation is limited. Differences based on racial background are most pronounced for African American children vs other groups. Adjustment for lean mass accounts for some, but not all of these differences. The relevance of accounting for racial background in bone health assessment and its clinical interpretation are discussed.

Keywords: bone density, body composition, bone health

ABSTRACTS OF PODIUM PRESENTATIONS





Presentation number: 01

BEZDANJAČA: OLD RESEARCH, NEW METHODS

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Originally discovered in the mid-sixties, Bezdanjača, a cave located in Lika, Croatia, was recognized as an important Bronze Age burial site containing several hundred individuals. Subsequent excavations retrieved a sizeable amount of finds, including material culture and skeletal remains, mostly skulls. Preliminary bioanthropological overview of around 30 skeletal and dental samples was conducted shortly after the excavations, while a more comprehensive and revised analysis followed decades later, which included new types of research such as stable isotope analysis of carbon and nitrogen for the purpose of diet reconstruction. This presentation will showcase new results of stable isotope analyses on dental and skeletal samples.

Keywords: bioarcheology, bioanthropology, osteology, stable isotope analysis, bronze age, Croatia



Presentation number: 02

XAVANTE: AN EXAMPLE OF INTERDISCIPLINARY FORENSIC RESEARCH OF HUMAN RIGHTS VIOLATION IN INDIGENOUS POPULATIONS

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Forensic archaeology and anthropology have proven their great usefulness in the analysis of recent human burials and the elucidation of possible crimes and human rights violations. The majority of forensic cases that we hear about involve contemporary Western societies. Nevertheless, human burials resulting from criminal activity, or otherwise direct or indirect violence also reach indigenous communities and isolated tribes. Forensic anthropological and archaeological work does occur in such settings. However, the logistics related to such activities greatly differ from the common and typical forensic cases. The environmental, landscape, legal and social issues related to such projects constitute challenges that greatly affect their execution. They have to take into account the community's interests and needs but also maintain the scientific integrity and reliability of the research. In the present communication, we will present the example of an unprecedented, community-based participative forensic archaeology and anthropology case of the Xavante community in Brazil. Our aim is to discuss the importance of human remains and academic responsibility to respond to human issues in the context of original populations in order to minimize violence against minority groups, including murder and human rights violations.

Keywords: indigenous issues, forensic archaeology, forensic anthropology, human rights violations, Brazil



Presentation number: 03

NEW POPULATION SPECIFIC STATURE RECONSTRUCTION FORMULAE FROM MEDIAEVAL EGYPT BASED ON LENGTH OF DRY LONG BONES

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Stature as one of the most eco-sensitive characteristics of the human body allows for general comparisons of the well-being of human groups. Stature reconstructed using linear regression formulae based on long bones is commonly used in analyses of skeletal series from archaeological excavations. It is generally agreed that stature to limb bone ratios are population dependent, therefore the most reliable regression formulae for stature reconstruction of skeletons would be based on the population to which they belong. This study is aimed at developing the regression formulae for a skeletal population from the mediaeval cemetery at Naqlun, which — based on the anatomical reconstruction of well-preserved skeletons — would make it possible to carry out a reliable reconstruction of stature for skeletons that are only partially preserved. The material used was excavated at a cemetery dated to the 11th–13th centuries CE. The graves were located in the ruins of the late antique monastery of Naqlun in the Fayoum Oasis, Egypt. To date more than five hundred burials have been excavated and 228 of the adult skeletons stored on site were sufficiently preserved to enable an anatomic reconstruction of stature. A morphological examination made it possible to classify 102 as females and 126 as males. To assess the uncertainty, all the long bones, vertebrae, and skull measurements were repeated in 50 of the cases by the same researchers after a certain period of time and, in the same number of cases, measurements were taken twice by different researchers. To date the only other set of regression formulae developed for Egypt was based on a group of skeletal series, of which 89% precede the current series by three thousand years (Raxter et al.: *Am J Phys Anthropol* 136 (2008) 147–155). The current work fills the gap constituting an alternative for the samples from mediaeval Egypt. This research was funded by the National Science Centre, Poland, 2022/47/D/HS3/02162.

Keywords: bioarchaeology, stature reconstruction, linear regression



Presentation number: 04

GORJANI MURDERS: ANTHROPOLOGICAL ANALYSIS OF TRAUMATIC INJURIES FROM A LATE MEDIEVAL SITE

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The analyses of human skeletal remains use methods from bioarcheology, paleopathology and forensic anthropology, often revealing violent episodes which can improve the understanding of violence in past populations. Traumatic injuries can be distinguished, based on time of occurrence, into antemortem and perimortem traumas. Antemortem trauma happens before death and is characterized by healing and remodelling while perimortem trauma occurs at or near the time of death and there is no sign of healing. The latter are of special interest because they usually witness someone's murder. In the archaeological excavations in Gorjani near Đakovo (Eastern Croatia), which have been carried out since 2017, 138 graves from the late medieval period have been researched. As part of the anthropological processing, a demographic and paleopathological analysis of all skeletons was made. Many recorded traumas in adults, especially perimortem ones, point to some kind of violence. Perimortem traumas were found in seven individuals (six males and one female), of which two males ended up being beheaded. The question arises as to what kind of episodes of violence this could have been? Historical sources mention two battles from the area of Gorjani: the battle of 1386 related to the struggle for the Hungarian throne and 1537 the battle against the Ottomans. The lecture will discuss the types of injuries, their distribution on the skeleton as well as by gender and age, and whether they can be related to the previously mentioned events.

Keywords: Gorjani, late medieval period, perimortem trauma, battles



Presentation number: 05

PULP STONES PRESENCE IN MOLARS OF PAST HUMAN POPULATIONS - THE POTENTIAL INFLUENCE OF SELECTED FACTORS

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The knowledge about the causes of pulp stones occurrence in human teeth is far from complete and most traits described as influencing their prevalence are considered controversial. Studies on the occurrence of these structures in the teeth of representatives of ancient human populations are extremely rare. The main aim of this study was the assessment of the occurrence of pulp stones in two samples of past human populations and determining the importance of sex, dental wear and type of population (non-industrial and industrial) for their formation. The three types of permanent lower molars (first, second and third, n = 169) belonging to 43 adults from two different populations: Czeladź Wielka (the 13th-14th century) and Wrocław (the 19th-20th century) were examined. For each tooth, the degree of dentine exposure was assessed using precise point scale and the presence/absence of pulp stones (by using their tomographic images and appropriate software). The sex determination of the individuals to which the examined molars belonged was performed according to standard methodology applied in the case of the skeletal collections. Detailed statistical analysis was performed (for each type of molar separately) taking into account the division into sex and population type. A non-significant relationship was found between the occurrence of pulp stones and two traits: sex and type of population - contrary to the degree of molar wear (but not in the case of all groups of molars). The hypothesis of the meaning of the dental wear for the formation of pulp stones was only partially supported, but this could be due to the influence of other factors that were not taken into account in this study (e.g. dental caries and/or type of diet). The results suggest that the occurrence of pulp stones could be mainly caused by dental wear in non-industrial population and mainly by other factors not included in this study in the case of the second of the examined samples.

Keywords: pulp stones, dental wear, past populations



Presentation number: 06

GENETIC INSIGHT IN THE LATE AVAR POPULATION FROM CROATIAN TERRITORY – THE STORY OF SOCIAL ORGANIZATION, ANCESTRY AND ADMIXTURE TOLD BY ANCIENT DNA

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Avars arrived in the 6th century from the Eurasian steppes to the Pannonian Basin and establishing an empire lasting for over 200 years. Their dominations diminished in the early 9th century and the questions about their fate and position in the Medieval Europe remained largely unanswered by historical records. Also, very little was known about Avars from contemporary Croatian territory dated to the late Avar period (8th century). In order to shed light on those populations we have analysed ancient human remains from two excavation sites (Šarengrad- Kloparski and Nuštar) from eastern Croatia. The aim was to assess their genetic ancestry and assimilation with indigenous population of the same period, as well as to possibly establish their social organization. Extraction of aDNA and library preparation were performed in dedicated clean aDNA facilities. Sequencing was performed on Illumina instruments. Haplogrep2 was used to assign mtDNA haplogroups, and Yleaf program to infer Y haplogroups. Kinship analysis up to the 3rd degree of ancestry was estimated using the READ and TKGWV2 methods. Kinship analysis and the type of burial revealed certain elements of social stratifications in our sample. Also, the results of genetic analysis are in line with other research of late Avar sites (8th-9th century) from Hungary and Slovakia, showing high level of intermixing with local communities, but also minor but traceable Asian genetic elements.

Keywords: Avars, ancient DNA, Croatia



Presentation number: 07

GERIATRIC PALEOEPIDEMIOLOGY: SKELETAL MARKERS OF QUALITY OF LIFE IN ELDERLY POPULATION FROM TWO AVAR PERIOD NECROPOLISES (SERBIA)

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Although looking at attitudes towards the elderly and their well-being within the community can help us to better understand the social foundations of ancient communities, the investigation of old age has been relatively neglected in bioarchaeology. This study will present skeletal markers of life quality, such as diseases, physiological stress and trauma patterns, of the elderly population in two Avar period necropolises. The Čik necropolis, dated between 6th and 7th CA, and the Gornje Sajlovo - site 40 necropolises, dated between 7th and 9th CA, are both attributed to the Avar cultural context. Only skeletons older than 55 years were included in this study. The total of 298 was analysed, 102 from Čik and 197 from Gornje Sajlovo - site 40. On Čik, 6% were recognized as elderly, while on Gornje Sajlovo - site 40 - 6.1%. In Čik, all individuals were females, and in Gornje Sajlovo - site 40, seven males and five females were recorded. Overall, degenerative diseases were identified in 12 cases, porotic lesions of cranium in three cases, and postcranium in two cases, and traumatic injuries were recorded in four cases. Three were probably accidental and one was a blunt force trauma of the cranium. The overall paleoepidemiological picture suggests a small percentage of elderly individuals with an expected high prevalence of degenerative diseases. All recorded injuries were well healed with no traces of complications. On one female skeleton we recorded signs of chronic sinusitis, and on one male skeleton hip dysplasia was diagnosed. One female suffered from the initial form of hyperostosis frontalis interna. In this study, there is a prevalence of females in the small elderly population. The small percentage of metabolic diseases suggests a sufficient diet and relatively good living conditions. The presence of hip dysplasia, potentially limiting everyday functions, suggests that this individual probably received some form of health care, provided probably from locally.

Keywords: geriatric paleoepidemiology, Avar period, elderly population, Čik, Gornje Sajlovo - site 40



Presentation number: 08

HEALTH STATUS AND SOCIAL ROLE DIFFERENCES AMONG SEXES IN A MODERN ITALIAN ANTHROPOLOGICAL CONTEXT: COMBINING PALEOPATHOLOGICAL, ANTHROPOLOGICAL AND FUNERARY DATA

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In the last years, there has been a growing interest in the study of sex and gender differences in the past. Bioanthropology, through the integration of anthropological, paleopathological, and funerary data, can give information not only on the health status of individuals, but also on the socio-cultural organization of past societies. In this study, we analysed the skeletons of 112 adults from the St. Biagio Cemetery (Ravenna, 17th-19th Century, Italy). This study aims to give an overview of the health status, with a focus on sex differences, and to highlight possible different roles between males and females. Anthropological analysis (sex and age at death estimation) was carried out using classical methods. Frailty was assessed using the biological index of frailty (BIF) on 104 individuals and paleopathological analysis was conducted using macroscopic and radiological methods. The difference in frailty (evaluated through ANCOVA adjusted for age) is not statistically significant between sexes, with similar mean values that fall into the “medium frail” category. Males and females were equally affected by pathologies in all age classes. The distribution of diseases was similar between the two sexes, except for metabolic disorders, congenital diseases, and neoplasms that were only found in males. Interpersonal violence was widespread throughout the site but only males presented multiple inflicted traumas. Concerning the analysis of funerary treatments, there were 12 cases of non-conventional burial treatments among both sexes. For example, various individuals of both sexes were found with isolated skulls while evidence of marginalization has been shown only in female individuals. In conclusion, males presented more pathologies and inflicted trauma than females, but frailty was similar in both sexes. Non-conventional funerary treatments were used only in the middle and older adults of both sexes, but marginalized positions were recorded only in female individuals.

Keywords: Health status, gender archaeology, Bioarcheology, Italy, funerary treatments, care and compassion



Presentation number: 09

A 'MADMAN' ON THE BATTLEFIELD? A FORENSIC AUTOPSY IN BUCHAREST, ROMANIA, FROM THE CRIMEAN WAR

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This study presents a post-mortem exploratory autopsy of an adult male excavated from the Saint Sava monastery graveyard in the centre of Bucharest. According to archaeological context and historical sources, the autopsy was performed on an officer of the Russian Imperial Army between 1853-1854, likely by surgeons of the Russian army at the Colțea Hospital. Macro- and microscopic analysis of the skeletal remains revealed preserved skeletal damage related to disarticulation and dismemberment of the remains for removal and examination of the central nervous system. The overlying soft tissues of the calvaria and spine were removed with a scalpel-like instrument, the calvaria was removed with a thin-bladed handsaw, and a laminectomy was performed using a rachitome. A scalpel was then used to incise the spinal nerves and other connections of the spinal cord to the rest of the body, while cut marks on the cranial base bones indicate the intention of taking the cranial contents and spinal cord en bloc. This is the first case of an autopsy from a historical period identified in Romania, which is more interesting as the skeleton shows no signs of violence and the stages of the autopsy are different from the current practice of 19th-century physicians. The manner in which the autopsy was conducted, the pathological changes of the skeleton, and the historical sources indicate a forensic autopsy whose purpose was to identify the effects of infectious diseases, possibly congenital syphilis, on the central nervous system.

Keywords: Bucharest; Crimean War; forensic autopsy; congenital syphilis.



Presentation number: 10

A REMARKABLE DISCOVERY OF THREE EARLY MEDIEVAL HUMAN SKELETONS IN A STORAGE PIT IN MODRÁ NEAR VELEHRAD (CZECH REPUBLIC)

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In 2023, while conducting rescue excavations prompted by the construction of a new exhibition building, a storage pit containing the skeletal remains of three individuals placed one above the other was discovered in the area of the open-air archaeological museum site in Modrá near Velehrad (Zlín Region, Czech Republic). The skeletons, accompanied by a large number of animal bones (cow, pig, horse, sheep/goat) and a few pottery fragments, were lying in non-standard positions. Furthermore, a large quern-stone was placed vertically at the bottom of the pit. The skeleton placed in the lowest position belonged to an old woman lying crouched on her right side. A cow's skull had been laid on her right knee, which was bent over the edge of the quern-stone. Given the dislocation of her skull, the number of ashes in the backfill around the skeleton, and the blackish-grey-coloured surface of most of the bones, we cannot rule out decapitation and attempted cremation of the body. A little higher up at the opposite wall of the pit, the skeleton of a man aged 40-50 years, lying on his left side, was uncovered. His hands were clasped, with his right elbow touching the nasal part of the cow's skull. About 10 cm above the male skeleton was the skeleton of a woman aged 40-60 years in a crouched position on her back. This suggests she had probably been bound before being thrown into the pit. Two earrings were found near her skull. The site is located near the burial ground and foundations of a 9th-century Great Moravian church. However, the situation described is unlikely to be related to the Great Moravian settlement since radiocarbon dating places the skeletons as most probably originating in the first half of the 8th century, i.e. in the period before the Slavs in the region adopted Christianity, when their dead were preferably cremated. It is all the more challenging for us today to decipher what happened in these places 13 centuries ago.

Keywords: Early Middle Ages, deviant burial, bioarcheology, decapitation, human sacrifice



Presentation number: 11

ANALYTICAL CHEMISTRY IN ANTHROPOLOGICAL RESEARCH – INANTRO PERSPECTIVE

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Analytical chemistry is nowadays an inevitable part of the interdisciplinary and holistic nature of the anthropological research. Using various chemical analytical methods (organic, inorganic, multielemental, stable isotope...), it is aimed to provide additional knowledge on numerous subjects, such as — nutritional and other habits and lifestyle of ancient populations, use of the archaeological non-biological artefacts (e.g. ceramic pottery), analysis of disease and skeletal trauma on archaeological skeletal remains, environmental exposure to various chemicals or elements that influence human health and disease (e.g. chemicals and elements with endocrine-disrupting properties), population studies, proteomic and metabolomics analyses etc. Special emphasis will be given to the INANTRO perspective, including national and international research projects and pilot studies that take advantage of the chemical analyses to provide explanations and answers to research questions that would otherwise remain unanswered. Among these, studies of the role of lead poisoning in rural and urban settlements within the Roman province of Dalmatia (Croatia), using a combination of elemental analysis of lead levels within dental samples of non-adults and macroscopic paleopathological analysis, as well as a research on a comprehensive investigation of human remains and material culture from ten ancient sites from Croatia, including chemical analyses of stable carbon and nitrogen isotopes and lead analysis, will be presented. Also, studies of the role of endocrine-disrupting chemicals in occurrence of the complex diseases and clinical course and outcome of COVID-19 disease will be elaborated.

Keywords: analytical chemistry, anthropological archaeology, anthropology, complex diseases, interdisciplinary approach



Presentation number: 12

VIRTUAL ANTHROPOLOGY AS CULTURAL AND RESEARCH RESOURCE: THE DIGITALIZATION AND ETHICAL MANAGEMENT OF THE DOCUMENTED HUMAN OSTEOLOGICAL COLLECTIONS (DHOCS) OF THE UNIVERSITY OF BOLOGNA

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Human skeletal remains represent pivotal evidence for understanding human evolution and population dynamics. In the last decades, Virtual Anthropology has emerged as a powerful tool for conducting research on human skeletal remains in anthropology, archaeology, and forensics. By using 3D imaging technology, researchers can conduct non-destructive dissection, morpho-functional analyses, and geometric morphometric to explore evolutionary variations and reconstruct the life histories of populations and individuals. In addition, Virtual Anthropology has profound implications for conservation, data sharing, and cultural heritage valorisation. Digitization reduces the risk of damage to fragile bones and allows for virtual reconstructions, ensuring their preservation. Furthermore, digital databases facilitate global collaboration among researchers and promote participative culture through online exhibitions and interactive educational initiatives. However, the ethical dimension of digitized human remains presents complex challenges. While they are recognized as bio-cultural archives by the academic community, their juridical status still lacks clear guidelines for management, access, and reuse. Efforts to navigate these challenges include adherence to research ethics principles, as well as compliance with national and international regulations governing the handling of human remains. Within the CHANGES project, the digitalization of the Documented Human Osteological Collections of the University of Bologna (Italy) seeks to address these issues. By providing open access to 3D scans and models of human skeletal remains, the project aims to facilitate interdisciplinary research and contribute to the preservation and accessibility for future generations. This virtual database attempts to apply best practices for managing digital human skeletal remains considering the ethical, scientific, cultural, and social implications surrounding this sensitive bio-cultural asset.

Keywords: Virtual Anthropology, human skeletal collections, bio-cultural assets, open-osteology, datasharing, ethics



Presentation number: 13

EXPLORING THE ASSOCIATION BETWEEN BODY SIZE, GROWTH AND LOWER LIMB BODY COMPOSITION AND INJURIES IN YOUNG ELITE SOCCER PLAYERS

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Soccer is one of the three most popular team sports among children and adults. Indeed, is estimated to be played by over 250 million players worldwide. Despite the well-known benefits of sports participation in children and adolescents, the rate of injuries in soccer is very high, especially during games (it is estimated to be between 9.5 to 48.7 injuries per 1000 hours), with an increasing trend with increasing age. Few studies have documented the role of anthropometric and body composition measures, as well as maturity offset and growth rate, on injury occurrence. This study aims to: i) analyse body composition and anthropometric measures in a sample of Italian youth elite soccer players and ii) explore the relationship between maturity and peripheral body composition on injury rate. A total sample of 185 youth athletes from under-9 to under-15, who played soccer in two elite soccer clubs, participated in this study and were evaluated for an entire soccer season (from September to May). Lower limb body composition and maturity offset were estimated based on anthropometric data and the number, type, location, and severity of injuries were collected using standardized protocols. Younger players (U9-U12, n=79) are significantly lighter and smaller than older players (U13-U15, n=106), as expected. Older players have also significantly higher mean BMI, calf fat percentage, and thigh muscle area than younger players. The total number of injuries was 67, with an incidence of 0.43 per player, and the majority were moderate or severe. Significant associations have been found between injury occurrence and lower limb fat and muscle area; years at peak height velocity did not seem to be associated with injury risk in our sample. Given the results of this study, is fundamental for coaches to evaluate and consider the body composition of young athletes to reduce the risk of injuries.

Keywords: Soccer; injuries; anthropometry; body composition; growth



Presentation number: 14

THREE-DIMENSIONAL DATABASE OF FACIAL ANTHROPOMETRIC PARAMETERS OF AZERBAIJAN POPULATION

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Facial morphology is a constant topic of concern for clinicians. Normative data of facial measurements are indispensable to precise determination of the degree of deviations from normal. Aim. Establish database of facial anthropometric parameters of Azerbaijan population. Method. The study group consisted of 900 healthy young subjects, 450 males and 450 females, from 7 different regions of Azerbaijan. Age groups: I - 18-25; II - 26-45; III- 46-65 years. All subjects underwent 3D facial scanning using a Bellus- Arc 7 scanner (California, USA). The anthropometric examination was performed according to L.Farkas's method with our modification. In order to determine the morphologic characteristics of seven regions of the craniofacial complex 42 anthropometric measurements were selected. The measurements were collected with MeshLab software (MeshLab, MeshLab). The anthropometric examination included the usage of 33 anthropometric landmarks. The 80 indices of the craniofacial proportions were calculated: head -10, face -23, nose-23, lips-9, orbits -11, ears-4. Results. Anthropometric measurements of facial proportions in Azerbaijan population revealed a significant difference between men and women, according to sexual dimorphism. In comparison with North American whites, considerable differences of facial proportions were observed in the head, face, orbits, labio-oral, nose and ear region. However, in women of the Azerbaijani population, 29 out of 80 proportion indices were similar to the proportions of NAW women. In the men of the Azerbaijani population, 27 out of 80 proportion indices did not reveal a statistically significant difference from the proportions of NAW men. Conclusion. Estimation of the reference range of facial proportions in Azerbaijan population might be helpful to formulate surgical plan in treatment of congenital or post-traumatic facial deformities successfully.

Keywords: Bellus- Arc 7 scanner, facial morphology, anthropometric measurements, proportion indices, Azerbaijan population



Presentation number: 15

BRIDGING HERITAGE AND PROGRESS: PERSPECTIVES ON TOURISM DEVELOPMENT IN GORSKI KOTAR, CROATIA

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This research delves into the paradoxical scenario of Gorski Kotar, a region nestled in the historically rich Croatian landscape. Despite being situated in the tourism-centric county of Croatia; the region faces a notable deficiency in tourism offerings. Focusing on key elements of large infrastructure, including a historical road, a motorway, and a reservoir lake, this study aims to elucidate the untapped potential of Gorski Kotar's tourism sector. The Lujzijana road, a significant cultural heritage road, once served as a crucial route to the seaside, fostering transit tourism. However, with the advent of modern highway, the region has witnessed a decline in tourist engagement. The motorway, while expediting travel to coastal destinations, inadvertently bypasses the cultural richness and historical allure of Gorski Kotar, resulting in a lack of tourist stopovers. Furthermore, even though artificial, a Lokvarsko lake is harmoniously embedded in the natural landscape. Despite its scenic beauty, the lake has not been incorporated into the regional tourism narrative, hindering its potential contribution to the tourism industry. The research methodology employed a combination of semi-structured interviews with local residents and a comprehensive review of online articles, providing insights into the challenges and opportunities faced by the region. By examining the interplay between human, natural and built environment, the study seeks to bridge the gap between historical significance, modern infrastructure, and the region's inherent natural beauty. The findings provide insights into local perceptions, attitudes, and media representations, offering valuable perspectives for policymakers, tourism stakeholders, and researchers seeking to uncover tourism potential in overlooked yet culturally rich regions.

Keywords: infrastructure, tourism, media, local population, Gorski Kotar, Croatia



Presentation number: 16

SOCIAL MEDIA IN ANTHROPOLOGICAL SCIENCES

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Social media is revolutionizing the promotion of science in anthropology, enabling global collaboration, knowledge dissemination, and public engagement. Anthropologists leverage platforms like Facebook, Twitter, Instagram, and YouTube to transcend traditional academic boundaries. The democratization of information on social media connects researchers worldwide, fostering cross-cultural dialogue and collaborative projects. Anthropologists use visually engaging content such as infographics and videos to make complex concepts accessible. This multimedia approach enhances the impact of scientific communication, reaching a diverse audience. The interactive nature of social media facilitates real-time engagement through Q&A sessions, live discussions, and virtual events, promoting a two-way exchange of knowledge. Additionally, social media empowers anthropologists to amplify underrepresented perspectives, contributing to the decolonization of anthropological knowledge. Researchers actively advocate for inclusivity, challenging traditional power dynamics within the discipline. However, challenges like misinformation and ethical considerations necessitate a thoughtful and responsible approach to social media promotion in anthropology. In conclusion, social media is an indispensable tool for anthropologists, transforming the discipline by fostering inclusivity, accessibility, and global connectivity. Through these platforms, anthropologists contribute to a more equitable and diverse representation of human experiences, enhancing the impact and reach of anthropological research.

Keywords: social media, communications, popularization of science



Presentation number: 17

EXAMINING THE RELATIONSHIP BETWEEN ULTRA-PROCESSED FOOD CONSUMPTION, SOCIODEMOGRAPHIC, AND BMI: AN INVESTIGATION OF THE CHMS

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Nearly three-quarters of Canadian children have adverse levels of at least one cardiometabolic risk factor, and 27.5% of Canadian children are classified as overweight or obese. Research from other jurisdictions has begun to implicate ultra-processed foods (UPF) in the rise of a number of negative health outcomes, including a higher body mass index (BMI), waist circumference (WC), blood pressure (BP), and unfavourable blood lipid profiles. Data from Canada and from Canadian children specifically is limited. Drawing on the Canadian Health Measures Survey (2016-2017 and 2018-2019), the present study investigates the relationship UPF consumption, sociodemographic variables, and BMI in Canadian children and adolescents (ages 3-18, n=4865). Dietary data collected by Food Frequency Questionnaire were used to classify foods as UPF or not using the validated NOVA classification system which scores foods along a continuum based on the degree and nature of processing. Participants were grouped into quartiles based on percent of total energy consumed from UPF per day. Chi-square tests for categorical outcomes and ANOVA for continuous outcomes were conducted to assess differences between quartiles of UPF across various axes of interest. The percentage of daily energy from UPF ranged from 24.3% in the lowest quartile and 62.6% in the highest quartile. Males, those aged 9-18 yrs, those who were not breastfed as well as those with lower household income and education, had significantly higher intakes of UPF. The average BMI in the lowest quartile of UPF intakes (18.9) was significantly lower than that in the highest quartile (19.9) ($p < 0.001$). This data provides insight into populations at risk for high UPF consumption in Canada and adds to the growing body of literature demonstrating the detrimental health effects associated with UPF consumption in children.

Keywords: Ultra-processed foods, nutritional epidemiology, children's health, body composition



Presentation number: 18

ANTHROPOLOGICAL RESEARCH ON NUTRITION. WHAT THE MEDIÉVAL FRESCOES TOLD US.

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An extensive, multi — year anthropological and public health project of isolated populations in the Selška valley with international participation included data from registry books, morphological and anthropometric to DNA analysis, as well as research relating to way of life and health. Nutrition has a fundamental biological function it therefore has an impact on health. We obtained a wealth of data on the food and diet of the historical population from land registers, i.e. inventories of land ownership and yields of produce from the land (crops belonging to the landowner). We examined how today's population of the upper part of Selška valley where many traditional elements persist, feed themselves by visiting households and carrying out interviews. 24-hour menus for one day of the week and Sunday were also prepared and analysed. Our guideline was the holistic approach and that is why, when researching nutrition in Loško Selška region, we also looked at medieval art. Our attention was drawn to the frescoes from the 15th Century in Crngrob and Križna gora which told us a lot about life, work and food in the past. These imposing frescoes opus is a remarkable monument. From the depicted scenes of everyday life, much can be learned about social conditions, about of organization of society and the nutrition and diet of that time. This wonderful church wall paintings frescoes are very impressive, very special and are anthropologically extremely interesting.

Keywords: isolated populations, nutrition, health, holistic approach, Selška valley, frescoes, medieval art



Presentation number: 19

A WEAK TERATOGENIC INSULT INDUCES BONE LOSS IN ADULTS DEPENDING ON THE EMBRYONIC GENOME

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Background: Evidence shows pregnant mothers malnutrition can cause age-related bone loss. We hypothesize some teratogens at a sub-threshold teratogenic dose can also detrimentally affect bone health in adult offspring. We examined: 1) can some teratogens detrimentally affect skeletal health in adult offspring 2) extent such teratogenic exposure depends on the embryonic genome. **Methods:** For #1, ICR mice received a single of 5-aza-2-deoxycytidine (5-AZA) injection at a sub-threshold teratogenic dose on day 10 of gestation. Offspring femur was evaluated by Micro-CT. Activity of caspase 3 & miRNA expression (~380 miRNAs) was tested in embryonic hind limb buds collected 24 & 48h after injection. Also, primary cultures of femoral stromal/osteoblastic cells & osteoclast precursor cells were used to test the expression of RANKL & OPG & osteoclast formation level by TRAP staining. For #2, micro-CT comparison of structure & bone mineral density of the femur of male offspring of 5-AZA treated 57Bl/6J (C57) & C3H/HeJ (C3H) mice exhibiting a low (C57) & high (C3H) bone mass phenotype was done. **Results:** the femora of ICR 5-month-old male offspring exposed to 5-AZA had trabecular microarchitecture indicative of bone loss. In hind limb buds of embryos exposed to 5-AZA, altered expression of some microRNAs demonstrated as regulators of key osteoblastogenic genes were observed. Also, increased expression of RANKL in femoral stromal/osteoblastic cells of offspring of 5-AZA-treated females was found. Experiments in C3H & C57 mice show 5-AZA-induced loss of bone quality was registered in 6mo C3H offspring but not in their C57 counterparts. **Conclusions:** The study implies low-dose exposure to a teratogen can induce bone loss in adult offspring. Also, the data from C57 & C3H mice allows hypothesis that offspring inherently exhibiting a low bone mass phenotype may be more resistant to antenatal stress induced bone loss than those inherently exhibiting a high bone mass phenotype.

Keywords: TERATOGENIC INSULT BONE LOSS IN EMBRYONIC GENOME



Presentation number: 20

THE RELATIONSHIP BETWEEN ENDOCRINE STATUS AND BODY COMPOSITION IN ELITE HANDBALL PLAYERS (14-21 YS)

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Objective. To study the relationship between body mass components and sex hormone levels (both absolute and relative levels) in youth handball players. The analysis is a part of a large study to develop a new screening method for overtraining status in athletes. **Subjects and methods.** 175 elite Hungarian handball players (14-21 ys) were examined in 2023. Body composition (bone, muscle, fat mass) and bone structure (BMC, BMD) were analysed via DEXA examination. Saliva samples were collected to measure the concentration of testosterone and cortisol hormones in all subjects and 17- β -estradiol hormone level in females, hormone levels were estimated by ELISA method. **Results.** The absolute and relative levels of sex hormones (expressed in the percentage of the median reference values of the studied sex hormones recommended for the given age-group, as well as the ratio of sex hormone and cortisol hormone levels) were used to construct the athlete references of testosterone and 17- β -estradiol levels for subadults and young adults. As a summary, it could be stated that testosterone level of male athletes was higher, while 17- β -estradiol level of female athletes was lower than non-athletes in their age-groups. The preliminary results showed that testosterone/cortisol ratio in male handball players and the level of testosterone in females related with muscle mass, while 17- β -estradiol level did not relate with any of the studied body mass components in female athletes. **Conclusions.** Sex hormone levels of youth athletes showed deviations from the non-athlete references in both sexes. A new index of testosterone/estradiol and cortisol level is under construction for the screening of not normal level of sex hormones in athletes. It is our further aim to study fatigue, inflammatory and immune biomarkers beside the sex hormone levels to analyse their relations with injury status and risk in elite athletes.

Keywords: athletes; handball; sex hormones; body composition



Presentation number: 21

THE CHANGES IN THE PREVALENCE OF UNDERWEIGHT AND SHORT STATURE AMONG POLISH YOUTH FROM 1938 TO 2020

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The problem of underweight and short stature, especially in developed countries, is important but not discussed as frequently in the literature. This study aimed to examine the changes in the prevalence of underweight and short stature among Polish youth from 1938 to 2020. The study utilized five sets of cross-sectional data, collected between 1938 and 2020 in Kraków, Poland. The study group consisted of 24639 children and adolescents aged 3-18 years old. The height and weight were measured, and BMI was calculated based on those parameters. To determine underweight, Cole's cut-off points were used, while short stature was defined as body height falling below -2 standard deviations from the mean for age and sex. The statistical significance of the differences between the cohorts was assessed using the Chi2 test. For girls, the overall prevalence of underweight in 1938 and 2020 was very similar (about 9.5%). The highest values were recorded in 1983 (especially in the pubertal period), and in subsequent cohorts, the prevalence steadily decreased. It should be noted, however, that the highest prevalence of underweight in the 21st century characterized girls in the post-pubertal period. In boys, on the other hand, the overall prevalence of underweight varied more ($p < 0.006$) - the lowest percentage was recorded in 1938 (5.6%), the highest in 1983 (11.1%), and it has been steadily declining since then. The overall prevalence of short stature in both sexes is relatively small (1.5 - 2.5%) and has not changed markedly over the past 85 years. The prevalence of underweight increased markedly between 1938 and 1983, indicating worsening environmental conditions (WWII, communist period). However, a decrease in the prevalence of children with underweight has been recorded in the last 4 decades, also illustrating the impact of the socioeconomic environment. As is well known, both underweight and short stature can have a substantial impact on the current and future health of children

Keywords: underweight, short stature, children, secular trend



Presentation number: 22

IMPACT OF MATERNAL CHARACTERISTICS ON PREGNANCY OUTCOME: A HOSPITAL-BASED FOLLOW-UP STUDY AMONG THE BENGALI POPULATION OF KOLKATA, INDIA

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In view of the high rate of Low-Birth-Weight cases among the Bengali population in Kolkata, a total of 189 singleton pregnancies (who began antenatal medical consultation on or before the 4th week of pregnancy) were included for a follow-up study at two multi-specialty hospitals in Kolkata, India. As per the secondary resources low-birth-weight babies were quite frequent in the nearby localities of the two hospitals. Mothers were followed up in each trimester until parturition. Maternal socio-demographic profile, reproductive history, anthropometric and hemodynamic factors for each trimester as well as late gestational metabolic profiles along with lifestyle patterns were recorded. Maternal characteristics were divided into two groups based on the pregnancy outcome in terms of the neonatal birth weight (Low Birth Weight and Optimal Birth Weight). The 189 pregnancies lead to 25.92% low birth weight babies. A single case of macrosomic child was reported having maternal characteristics of class II obesity at 1st trimester, dyslipidaemia and gestational diabetes. Maternal anthropometric profile showed that the third trimester weight, gestational weight gains and gestational BMI gain contributed significantly to the manifestation of low-birth-weight babies. As far as hemodynamics profile of the mothers were concerned, the difference of SBP and MAP during the first trimester only had significant contribution to the low-birth-weight babies. Late pregnancy metabolic profile of the mother did not impact the birth weight. Regression analysis showed that mothers who gained weight in their third trimester pregnancy were more likely to produce low-birth-weight babies. As per Beck's depression classification, psychologically stressed mothers contributed significantly towards low-birth-weight babies.

Keywords: Maternal health, Follow-up study, Low Birth Weight, Bio-social factors, India



Presentation number: 23

ESTIMATION OF SKELETAL AGE THROUGH DRY BONE ANALYSIS: A STUDY ON SHOULDER AND WRIST DEVELOPMENT FROM BIRTH TO ADULthood.

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Growth reflects incremental increases in size, whereas maturity signifies the attainment of a fully developed and specialized adult form. These two distinct yet interrelated processes form the foundation of what we term skeletal development (Roche, 1992). The study of skeletal development has been predominantly conducted using radiographic techniques. Yet, the investigation of these processes through the analysis of dry bones remains notably underrepresented in scientific literature. This scarcity of dry bone data poses significant obstacles in the accurate identification of skeletal remains and the precise estimation of skeletal age, particularly within the fields of forensic anthropology and archaeology. To bridge this gap, our research utilizes an array of dry bone specimens from two distinct collections, spanning from birth to 20 years, aiming to estimate the bone transformations of the shoulder and wrist—two of the most crucial joints in human anatomy—during developmental progressions. Our methodology involved processing the sample using advanced high-resolution 3D scanning technology. Subsequently, we conducted various geometric morphometric analyses on the complete sample, which comprises 87 scapulae, 153 clavicles, 102 humeri, 40 scaphoid bones, 36 lunate bones, 38 distal radial epiphyses, and 41 capitate bones. The results indicate that the morphological variations associated with age progression are suitable for establishing age groups based on skeletal maturity. These variations are correlated with the onset and fusion of the ossification centres, hormonal transitions, and biomechanical factors. Thus, our findings not only facilitate the creation of a novel method for determining skeletal age but also enrich our comprehension of the human body's developmental processes. Bibliography: Roche, AF. Growth, Maturation, and Body Composition: The Fels Longitudinal Study 1929-1991. (Pp 282; C37 50.) Cambridge University Press, Cambridge, 1992. ISBN 0-521-37449-9

Keywords: Skeletal development, geometric morphometric, physical anthropology.



Presentation number: 24

WHICH CONTRIBUTES MORE TO THE MAXIMUM GROWTH GAIN IN STATURE, SITTING HEIGHT OR LEG LENGTH USING A NEW BPC (BODY PROPORTION CHART)?

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INTRODUCTION: Growth in leg length terminates, on average, earlier than growth in sitting height, which continues until late adolescence. Sitting height thus contributes more to the adolescent gain in stature than leg length. From another viewpoint, this paper attempts (1) to confirm which contribute more to the maximum growth gain in stature (MAHG: Maximum Annual Height Gain), the growth gains in sitting height at the peak height velocity (SHG: Sitting Height Gain at MAHG) or leg length at the peak height velocity (LLG: Leg Length Gain at MAHG) and (2) to describe variation in contribution of the SHG and LLG, and (3) to examine relationship between individual versus average growth by using longitudinal data. **SUBJECTS AND METHODS:** The data are from annual health examination surveys conducted by school health teachers. A longitudinal data set spanning the 1st grade of elementary school through the 3rd grade of high school was extracted from serial surveys. The subjects born from 1980 to 1986 were healthy, adequately nourished Japanese youth (boys: 520, girls: 306). The measurements used were stature and sitting height. Leg length was estimated as stature minus sitting height. Age at peak height velocity was estimated on the BPC and MAHG were calculated, and also calculated SHG and LLG for each individual, respectively. To examine growth variations among individuals using a new BPC (LUGC: Lower Segment - Upper Segment Gain Chart) whose idea is the same as the BPC. LUGC simultaneously describe MAHG, SHG, LLG and LUGR (Lower segment -Upper Segment Gain Ratio) on a single graph. LUGR was derived as $LLG / SHG \times 100$. **RESULTS:** Cross-sectional analyses (average growth) showed that the LLG contributed more to the MAHG than the SHG. However, longitudinal analysis showed that there were some variations on contribution of the SHG and the LLG. Thus, longitudinal observations on an individual may be as different from mean trends in a longitudinal study of a population.

Keywords: peak height velocity, stature, sitting height, lower limb length, BPC



Presentation number: 25

DEVELOPMENTAL DIFFERENCES IN DYNAMIC INDICATORS OF THREE SIMPLE COGNITIVE SUB- SYSTEMS FUNCTIONING OBSERVED IN GIRLS AND BOYS AGED 8-17 YEARS

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Mainstream post-Piaget cognitive development researchers mostly ignored performance dynamics behind the total paper-and-pencil tests score, or average reaction time on computerized tests. Like other Dynamic Systems Theory applications in cognitive psychology, this research focuses on several indicators of performance dynamics while solving three computerized cognitive tests of various complexity. In order to get developmental picture of the corresponding cognitive subsystems and their dynamics, the tests were solved by girls (N=228) and boys (N=253) aged 8-17 years. Study participants were students of a primary and a secondary school from Zagreb (Croatia) that individually solved three simple tests of MID KOGTESTER-1 computerized reaction-meter, which assessed perceptual and working memory functioning of various complexity. Four reaction-time dynamic indicators (minimal, maximal and average time of cognitive task solving, and average time of non-optimal task solving) were mostly positively correlated, sharing an average variance of 37% - thereby presenting non-redundant measures of cognitive dynamics. The non-trivial and significant results were: (1) age-related decrement of all 4 indicators was non-linear, but with different shape (related to indicator); the decrement was steeper for more complex tests and more steady for girls; (2) girls outperformed boys in all indicators but minimal time of cognitive task solving, although the intensity of the differences depended on the indicator type and test complexity; (3) inter-individual variability of all dynamic indicators of related cognitive subsystem functioning decreased with age and increased with test complexity. Dynamics of cognitive subsystem functioning reflects at least the consolidation level of cognitive and neural structure behind the cognitive performance and its development. Therefore, performance dynamics indicators contribute to our understanding of human cognitive development.

Keywords: cognitive development, indicators of performance dynamics, sex differences, inter-individual variability



Presentation number: 26

TIMING OF SEXUAL INITIATION AMONG POLISH ADOLESCENTS AND ASSOCIATED FACTORS: IMPLICATIONS FOR HPV VACCINATION PROGRAMMES AND FUTURE FERTILITY

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Objectives: Initiation of sexual activity before the age of 15 is recognized as a risky behaviour associated with several negative reproductive health outcomes, including sexually transmitted infections, unwanted pregnancies, unsafe abortions and the potential for later infertility. This study aims to determine the age at which Polish adolescents initiate sexual activity, identify factors influencing this behaviour, and use this information to recommend prophylactic vaccination against human papillomavirus (HPV). **Methods:** Data were obtained from the population-based, cross-sectional ADOPOLNOR study, focusing on a subset of 1571 boys and 1580 girls aged 13-19 years. Participants completed the Polish version of the Youth Quality of Life Instruments (YQOL-R), supplemented with additional questions on sexual activity. Socioeconomic, behavioural, educational and peer approval variables were considered as potential predictors. Median age of sexual debut was calculated using Kaplan-Meier estimation. Univariate and multivariate logistic regression (MLR) models were used to assess the crude and adjusted effects of selected predictor variables on sexual debut, reported as odds ratios (ORs). **Results:** Among boys, 4.8% reported sexual debut before age 15, compared with 3.2% of girls ($p=0.025$). By the age of 18-19 years, 40.2% of boys and 34.9% of girls reported sexual initiation ($p=0.299$). The median age of first sexual intercourse was 16.49 years for boys and 17.08 years for girls ($p<0.001$). MLR analysis revealed that predictor variables for sexual debut before age 15 for both genders included low educational attainment, smoking, and substance abuse and additionally for boys' rural residence and peer approval. **Conclusions:** This updated analysis of sexual initiation and associated predictor variables in Polish adolescents provides valuable insights for policy makers developing reproductive health policies and may serve as a recommendation for prophylactic vaccination against HPV

Keywords: adolescents, sexual initiation, smoking, substance abuse, educational attainment, peer approval, HPV vaccination



Presentation number: 27

FEMALE FINGER PROPORTION AS AN INDICATOR OF THE HIGHER BLOOD PRESSURE RISK.

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The association between predictor of the prenatal sex hormones steroids: second to fourth finger ratio and parameters of blood pressure has been considered as the aim of this study. The study included 171 children (93 girls and 78 boys) aged 6-13 years who were examined in Łódź in central Poland in years 2016-2017. Measurements consisted of the length of the second and fourth fingers using a Vernier calliper and blood pressure parameters: diastolic (DIA), systolic (SIA) and pulse using blood pressure monitor. Girls with higher 2D:4D digit ratio for the left hand tend to have higher systolic blood pressure (positive correlation, $\tau=0.14$; $p=0.04$). Boys with female pattern had higher diastolic pressure (median=68.19 mmHg) than those with the male pattern (median=63.69 mmHg) ($Z = -2.11$; $p = 0.033$). Prenatal steroid hormone proportion may be related to blood pressure in the later human ontogenesis. Finger ratio might be a possible indicator of the higher blood pressure risk. The association between predictor of the prenatal sex hormones steroids: second to fourth finger ratio and parameters of blood pressure has been considered as the aim of this study. The study included 171 children (93 girls and 78 boys) aged 6-13 years who were examined in Łódź in central Poland in years 2016-2017. Measurements consisted of the length of the second and fourth fingers using a Vernier calliper and blood pressure parameters: diastolic (DIA), systolic (SIA) and pulse using blood pressure monitor. Girls with higher 2D:4D digit ratio for the left hand tend to have higher systolic blood pressure (positive correlation, $\tau=0.14$; $p=0.04$). Boys with female pattern had higher diastolic pressure (median=68.19 mmHg) than those with the male pattern (median=63.69 mmHg) ($Z = -2.11$; $p = 0.033$). Prenatal steroid hormone proportion may be related to blood pressure in the later human ontogenesis. Finger ratio might be a possible indicator of the higher blood pressure risk.

Keywords: Hypertension, 2D:4D, prenatal steroids



Presentation number: 28

THE EVOLUTION OF THE SOCIAL REGULATION OF GROWTH

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Background: Animal societies are structured by dominance hierarchy and can be viewed as networks. Recent analyses highlighted the importance of pairwise agonistic contests, inter-individual signalling and winner-loser effects on the emergence of efficient network structures. Efficiency is a natural target in the evolution of social structures. State of the art: Success in contests reflects “hard skills”: physical fitness, resource holding power, fighting ability, mirroring an individual’s current metabolic and endocrine condition. Handsome sex characteristics, impressive weaponry and large body size reflect fitness and fighting ability. Success also depends on current opportunities, motivation, and the ability of signalling one’s physical capabilities. “Soft skills” mirror emotionality and preceding experiences. Both skills are reciprocally linked. Sexual attractiveness and size predispose to success, dominance, and upward social mobility. On the other side, a complex system of hypothalamic neuropeptides that regulates stress, sex steroids and skeletal growth allows for “adaptive developmental plasticity”, “strategic adjustments” and “competitive growth”. Aggression and the drive for status maintenance/improvement activate these neuropeptides and their endocrine sequelae which in turn then signal the respective attributes of dominance/subordination. Inter-individual signalling avoids lethal conflicts. Signalling facilitates rank adjustments, network centralization, thereby improving network efficiency, and survival at the group level, at low risk. Conclusion: The ability to signal dominance/subordination plays a crucial role in evolution. The hypothalamic-pituitary axes for stress and reproduction have been conserved for at least 700 million years; the hypothalamic- pituitary-IGF-1 axis for some 400 million years. Social growth regulation is an evolutionarily preferred long- term trait for optimizing social network efficiency.

Keywords: growth, dominance, subordination, competitive growth, hypothalamus



Presentation number: 29

SEASONAL CHANGES IN BODY COMPOSITION IN CHILDREN FROM MAYA AGRICULTURALISTS IN CENTRAL YUCATÁN, MEXICO

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Development policies have aimed to substitute subsistence agriculture for cash crops or other cash generating activities to encourage local farmers to depend on store-bought groceries available year-round instead of seasonal subsistence crops. In this paper we test the hypothesis that increased dependence on store bought foods has decreased seasonal changes in nutritional status and fat mass in Maya Children from Yucatan, Mexico. Weight for Age (W/A), Body Mass Index (BMI) and Tricipital Skinfold z scores in children under the age of 10 years from 14 Maya rural towns with different degrees of development were compared longitudinally between scarcity and abundance seasons using a Repeated Measures Analysis of Variance (RMANOVA). Height for Age (H/A) z scores were also estimated. It was found that origin of food consumed corresponded to the town's degree of development. Nutritional status (W/Az) and adiposity, BMI & Tricipital z scores, were significantly lower during the scarcity season in every community. W/Az, Tricipital skinfold z and H/Az scores were significantly higher in developed than in traditional towns, yet in both types of town W/Az and H/Az scores were below the WHO standard mean. Tricipital skinfold z score was only below the WHO standard amongst traditional towns during the scarcity season. To conclude, increased dependence on store foods failed to eliminate significant losses in body fat during the scarcity season. This failure may be affecting linear growth and promoting a thrifty phenotype that is seen in short and stocky individuals with a tendency to accumulate fat during abundance seasons.

Keywords: Nutrition transition, Thrifty Phenotype, Growth, Subsistence Agriculture, Body Mass Index, Tricipital skinfolds, Nutritional Status.



Presentation number: 30

LITTLE FORAGERS: EXPLORING THE ACTIVE ROLE OF PYGMY HUNTER-GATHERER CHILDREN IN FOOD ACQUISITION

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In traditional hunter-gatherer societies, children are seen as playing rather than directly involved in food acquisition. This study focuses on the daily activities of Pygmy hunter-gatherer children in a foraging forest camp. The research aimed to elucidate their time allocation and involvement in food procurement activities, as well as assess their contribution to the food acquisition process. Over a two-year period, we spent 22 days with the Baka hunter-gatherers, observing 16 children aged 5 to 18 from 06:00 to 18:00 each day, recording their behaviours minute by minute. The children actively participated in fishing and hunting small animals, independently acquiring 30% of the total wild food. When combined with the 20% obtained through collaboration with adults, children collectively contributed 50% to the overall food acquisition. Although children's food acquisition capacity was about one-third of adults', they managed to meet 80% of their nutrient requirements, with the remaining 20% coming from adult support. The study highlights how children maintained good nutritional status through adults' substantial food acquisition capacity and the fair food distribution characteristic of hunter-gatherer societies.

Keywords: hunter-gatherers, children, forest, food acquisition, time allocation



Presentation number: 31

UNRAVELING THE SIGNIFICANCE OF MOLLUSC SHELLS IN PREHISTORIC ADAPTATIONS: INSIGHTS FROM VLAKNO CAVE, CROATIA

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Archaeological research has pointed out the role of marine resources in modern humans' cognitive and cultural evolution. A significant share of these consistently exploited resources in prehistory is attributed to mollusc shells. Their dual anatomy, 1) the animal that resides inside a seashell, a mollusc, and b) shell, a complex covering skeleton, is considered vital for understanding maritime and human communities' interaction. Throughout human history, both parts have been used, either as food or to obtain hard animal materials for symbolic and technological productions. For a long time, archaeological studies on osseous materials have not considered the significance of the shell industry in techno-economic terms. This disparity arises from the conventional tendency of these studies to narrow the analysis of the shells exclusively to the production of ornaments. Recent archaeological studies supported by ethnographical evidence have provided important data on how certain types of bivalve shells have been used for different purposes, such as containers or various tools. Shells have been utilized as raw materials for almost 400,000 years, and in the Mediterranean, they have become frequent in Neanderthal sites in the form of retouched shell tools. Many Upper Palaeolithic sites with marine shells identified as beads are discovered in the Adriatic region. Among these sites, Vlakno cave has the wealthiest assemblage of marine shells. Within its rich Late Upper Palaeolithic sample of various marine shells identified as beads, the function of *Glycymeris* shells is ambiguous. Here, we would like to present a conducted microscopic surface analysis of the *Glycymeris* shells, and a reference collection of use-wear traces made experimentally by processing various animal, vegetal, and mineral materials on fresh *Glycymeris* to discern use-wear traces and possible use and function of the archaeological sample aiming to improve knowledge of past technological and social behaviours.

Keywords: Mollusc shells, coastal adaptations, Late Upper Palaeolithic, Eastern Adriatic



Presentation number: 32

MUSCULAR ROBUSTICITY AND STRENGTH IN ELITE HANDBALL PLAYERS

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Objective. The main aim of the analysis was to study morphological and strength parameters of the thigh region in elite handball players to explore age-group differences, sexual dimorphism, asymmetry characteristics of the structural and functional parameters in the studied body region and the associations among the studied parameters. **Subjects and methods.** 175 elite Hungarian handball players aged between 14 and 21 years were examined in 2023. Muscle mass component of the body segments was estimated by DEXA method and muscle thickness of the anterior mid-thigh region was measured by a new ultrasonic technique that provided the possibility to construct muscle mass prediction equations for the lower extremities. Strength testing of the knee extensor muscles was performed on a Kineosystem dynamometer using an isokinetic protocol. **Results.** A strong association between muscle robusticity and strength in the thigh region was confirmed in males, but not in females. A protective effect of 5-10% muscular robusticity dominance in favour of the jumping leg appeared in both sexes. A new predictive equation of muscle mass in the jumping leg and the total body from the muscle thickness in the anterior mid-thigh region of jumping leg was introduced by analysing the relationship between DEXA muscle mass estimations and ultrasonic measures of quadriceps femoris in the thigh. **Conclusions.** The exploration and understanding of asymmetric structural and functional adaptations can help athletes and trainers in planning the training and training interventions to reduce the risk of injuries. The ultrasonography of muscle layers (BodyMetrix BX-2000 ultrasound imaging unit) is an appropriate method for this purpose. Our aim is to study the relationship between muscle thickness and strength in other body regions in youth athletes.

Keywords: muscle mass; muscle strength; DEXA; ultrasonography; athletes



Presentation number: 33

THE EFFECT OF RUNNING ON BONE MINERAL DENSITY IN WOMEN DURING AGEING

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Background: Osteoporosis is a disease that occurs all over the world. Its prevalence in women is 23.1%. Physical activity belongs among significant exogenous factors for bone health. Some authors consider running to be a suitable physical activity (PA). However, many study results are inconsistent and bone density (BMD) is not always found to be higher in runners than non-runners. BMD is also influenced by ageing. In healthy individuals, BMD starts to decrease at the age of 40; it is reduced by 6–8% in ten years. The aim of the study is to analyse BMD changes in various age groups of runners and inactive individuals. **Methods:** The study included 608 women (304 runners and 304 non-runners) in five age groups (18–65). The runners ran 23.7–28.4 km/week on average; non-runners did not meet the PA recommendations by WHO. BMD was measured using a bone densitometer on the body, limbs, hips and spine. Both statistical and substantive significance (ES) were assessed in the differences found between BMD values of runners and non-runners. **Results:** The runners had a higher BMD in all body segments than non-runners. In all age groups, runners had statistically and substantially higher BMD in lower limbs; statistical significance ranged from $p < 0.05$ to $p < 0.001$ (ES: $d = 0.5$ to 0.8). In the age groups of 26–35, 46–55 and 56–65, runners had significantly higher BMD than non-runners not only in lower limbs, but also upper limbs and the body. The statistical significance ranged from $p < 0.05$ to $p < 0.001$ (ES: $d = 0.5$ to 0.7). Higher values in hips and spine in runners were not significant. **Conclusion:** The study results indicate that recreational running in an amount that can be implemented into everyday work life can have a positive effect on BMD values, namely in lower limbs. It helps maintain or slow down the reduction in BMD during ageing.

Keywords: osteoporosis, bone mineral density, age groups, recreational runners, inactive individuals



Presentation number: 34

NEW HAND-WRIST ATLAS FOR INDIVIDUALS FROM SUDAN

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Aim: The aim of this study is to present an atlas of hand-wrist maturity for each year of age describing skeletal maturity in a group from Sudan with known age and ancestry. **Methods:** The sample was selected from healthy patients attending a dental hospital in Khartoum with known age and ancestry (males = 280, females = 330; aged between 3 and 25 years). Bones were assessed from radiographs of the left hand and wrist after the Greulich and Pyle (GP) Atlas (1959) and median bone stages were noted for each year of age in males and females separately. Line drawings of the median bone stage per year were drawn. We highlight group differences between the new atlas and GP atlas, particularly for 15 to 20-year-old individuals. **Results:** Overall median ages were earlier in females than in males for specific bones. The difference could be as large as 2 years. In several instances, carpal bones were late maturing (>18 yo) and presented in an Atlas in a diagrammatic format for each sex over yearly age groups. **Conclusion:** The study describes bone maturity from Sudan and serves as a baseline for hand-wrist development in this endogenous East African group.

Keywords: hand-wrist, maturity atlas, East-Africa



Presentation number: 01

TRENDS IN OVERWEIGHT, OBESITY AND SEVERE OBESITY IN BERGEN, NORWAY (2010-2022) USING DATA FROM ROUTINE CHILD HEALTHCARE.

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Aims: Information on weight status is essential to guide the development of preventive measures, which can reduce adverse consequences for health. Data on prevalence and trends of unhealthy weight status during the last decade in Norway is limited and restricted to cohort studies. Our aim was to estimate the prevalence and trends of overweight, obesity and severe obesity before the pandemic (2010-2019) in 2- 14-year-old children and to evaluate if the prevalence during the COVID-19 pandemic years diverges from the predicted trend. **Methods:** This study had a repeated cross-sectional design. Data on weight and length were obtained retrospectively for calculation of body mass index (BMI) from standardized electronic child health and school health records. Weight status was categorized according to cut-offs proposed by the International Obesity Task Force (IOTF). Trends in the proportion of children above IOTF25, 30 and 35 were analysed using linear regression, at scheduled contacts at 2, 4, 6, 8 and 13 years. Prevalence estimates during COVID-19 was compared to the 95% prediction interval of this model. **Results:** A total 181,527 BMI measurements from 78,024 children were included. The participation rate was >95% in children aged 2, 4, and 6 and 80-90% in children aged 8 and 13. There was a significant decrease in the trends of overweight among 4- and 13-year-old boys. There were no significant trends in girls. During the pandemic, the prevalence of overweight in boys exceeded the predicted interval at ages 4, 6 and 8. For girls, a similar trend was observed only at age 6. **Conclusion:** There was a stabilization of overweight, obesity and severe obesity, and even a decreasing trend in preschool and adolescent boys between 2010 to 2019. Increased prevalence of overweight and obesity during the pandemic was more notable in boys than girls. Routine healthcare data is useful for estimating the prevalence of unhealthy weight status.

Keywords: Electronic medical record, overweight, obesity, pandemic, time-trends



Presentation number: 02

WEIGHT AND BMI DISTRIBUTIONS IN NATURAL OR 'NON-MODERN' POPULATIONS

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Body weight and body mass index (BMI) are usually taken as indicator of healthiness. Agreement exists that in a healthy population, both variables are skewed into the right i.e., the number of obese people and the magnitude of obesity is larger than number and magnitude of the slim people. Modern growth charts e.g., WHO charts, show this skewness in all data sets. We analysed the skewness of BMI and weight distribution (Shapiro-Wilk-Test) of 21 child and adolescent populations since the early 20th century from Germany, Hungary, India, South Africa, and Indonesia. Modern weight and BMI distributions are skewed, e.g., in German children since the 1980th. This is different in historic populations and in rural populations of developing countries, e.g., in Indonesia. In these populations, body weight and BMI show basically symmetric normal distributions. Mixed patterns of skewness are visible in societies in transition such as South Africa (1980th) and urban Indonesia. Modern references are inherently affected by the obesity pandemic with major weight and BMI skewness that is not evident in healthy traditional societies. Modern references grossly underestimate the true prevalence of obesity, and overestimate the prevalence of wasting in these people.

Keywords: weight, body mass index



Presentation number: 03

PROBLEMS OF ADOLESCENT HYPERTENSION AND ASSOCIATION WITH BODY FATNESS AND SCREEN TIME

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Both undernutrition and overnutrition affect children and adolescents' overall growth and development. Childhood obesity has been of concern as it can impact the health of children and adolescents, even when they grow up as adults. The present paper attempts to understand the problems of adolescent hypertension among adolescents and its association with body fatness and screen time. The study was conducted on 728 adolescents aged 15-19 years recruited from the school of Imphal city, Manipur. Blood pressure and related anthropometric data were collected. General obesity and central obesity measures, such as body mass index (BMI), waist circumference (WC), and waist-height ratio (WHtR), were extracted from anthropometric data. The prevalence of adolescent hypertension is 29.12%, and elevated blood pressure is 20.47%. Boys are more hypertensive than girls. Obese adolescents are more prone to hypertension. Overweight, obese, and abdominal volume index (AVI) has 2.31, 5.15, and 3.41 OR to develop hypertension significantly, irrespective of gender. Moreover, physical inactivity and spending more screen time greater than and equal to 6hrs a day are associated with central obesity among adolescents. In conclusion, it can be proposed that the problem of adolescent obesity is increasing, and it may affect the overall health of adolescents and even in the future. Policies on adolescent obesity management could be a suitable approach to control the problem at the earliest.

Keywords: Adolescent, Hypertension, Fatness, Screen Time, Anthropometric



Presentation number: 04

HEALTH OUTCOMES AND THEIR ASSOCIATIONS IN PRETERM SURVIVORS FROM BIRTH TO ADOLESCENCE: A LONGITUDINAL COHORT STUDY

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Background and aim: The study bridges the research gap by investigating health outcomes and disease patterns from birth to adolescence in preterm survivors, highlighting the necessity of integrated over isolated organ system research. **Materials and Methods:** In a retrospective longitudinal study of 417 preterm children until adolescence (201 boys, 216 girls, born 2000-2015), first-time diagnoses (1,818 total) from medical records were categorized using ICD-10 classification. Sex, birth weight (BW), and gestational age (GA) were analysed using Poisson and negative binomial regression to explore disease associations. **Results:** Premature children's primary disease burden spans from birth to preschool. Lower BW groups - "Extremely and very low", "Low", and "Sub-optimal" - displayed an increased number of diseases, by 1.77, 1.50, and 1.34 times, respectively, compared to the "Normal" BW group. Main logistic regression results for age [0-3]: perinatal conditions quadrupled the risk of nervous system diseases ($p < 0.01$); probability of having mental, behavioural disorder was over five times higher in those with nervous system or musculoskeletal conditions. Results for [4-7] years: endocrine, metabolic diseases more than doubled the odds of infectious diseases ($OR = 2.44$, $p < 0.01$); respiratory diseases were twice as likely with prior endocrine disorders ($OR = 2.04$, $p < 0.05$); genitourinary conditions were linked to prior infectious diseases ($OR = 4.02$, $p < 0.01$). For ages [8-12], endocrine, metabolic disorders were strongly associated with prior musculoskeletal conditions ($OR = 8.72$, $p < 0.001$); respiratory diseases exhibited a remarkable association with prior endocrine and metabolic diseases ($OR = 26.98$, $p < 0.01$). **Conclusions:** Logistic regression results advocate for the complex interactions between developing organs and their systems, which begin in prenatal life and continues throughout the growth period. An evolutionary approach will be presented and discussed.

Keywords: Prematurity, multimorbidity, longitudinal study, ICD-10, diseases



Presentation number: 05

D-SCORE: A UNIVERSAL MEASUREMENT UNIT FOR EARLY CHILDHOOD DEVELOPMENT

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The lecture explores the transformation within early childhood development circa 2014, when the absence of a precise global standard for measuring children's development became evident. Studies highlighted the critical importance of the first three years of life for future well-being, prompting urgent calls from influential organizations like WHO and UNICEF for a reliable, globally applicable measure. The D-score offers a single numerical representation of development derived from 57 basic measurements. Despite initial doubts, the D-score proved adaptable across diverse datasets, potentially serving as a global unit for child development, similar to centimetres or kilograms. Over the last decade, research on the D-score has expanded, offering practical benefits like result comparability and simplified analysis. The lecture will examine the developments so far and explore further avenues for research and application.

Keywords: Early Child Development, Rasch model, comparability, dscore R package



Presentation number: 06

GUIDANCE FOR INTERNATIONAL GROWTH STANDARDS: WHEN, WHERE, AND HOW TO APPLY INTERNATIONAL GROWTH STANDARDS

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Infant growth is a commonly used proxy of population health, human capital, and socioeconomic development. Additionally, failure to achieve growth potential is associated with increased risk of mortality and morbidity throughout an individual's life. Therefore, accurate growth assessment using international prescriptive growth standards is a key step towards efficient, accurate, and comparable tracking of progress towards achieving the Sustainable Development Goal 3.2, which aims to reduce preventable newborn and child mortality by 2030. Different growth standards exist and can lead to differences in growth estimates due to lack of comparability as a result of how they were constructed, study design, statistical methodology, etc. There is a lack of clear guidance on which growth charts to use when, and for whom. Consequently, growth standards are often applied incorrectly, leading to inappropriate assessment and interpretation of growth trajectories. This can alter prevalence estimates for stunting, wasting, and other indicators of non-optimal growth. In light of these challenges, the Guidance for International Growth Standards (GIGS) project has developed guidance and software to facilitate consistent, standardized, and accurate application of child growth based on the international standards from the INTERGROWTH-21st and WHO Child Growth Standards. This talk will detail guidance from GIGS on when, for whom, and how to apply international growth standards in settings where gestational age data is available. We will first discuss the rationale for the GIGS project, then present case studies of individual infants from a large cohort of moderately low birthweight infants in India, Malawi and Tanzania. We will use a scenario-based approach to demonstrate the implication of using/applying existing standards inappropriately and further, provide clear guidance on appropriate application of these international standards based on the GIGS-recommended approach.

Keywords: Growth standards, INTERGROWTH-21st, WHO child growth standards, Guidance for International Growth Standards



Presentation number: 07

ACCOUNTING FOR MISSINGNESS USING BAYESIAN JOINT MODELLING: A CASE STUDY USING LONGITUDINAL CHILD HEIGHT AND WEIGHT DATA

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Background Longitudinal data involve repeated measurements of the same individuals over time. In anthropometry, it is common for more than one aspect of growth measurement to be taken at each time point of data collection e.g., weight and height. In follow-up studies of child growth, missing data for one or more growth measurements is common. Joint modelling of two or more associated longitudinal measurements can allow borrowing of information for correlated data in cases where there is missing data for one variable of interest. Therefore, we propose to evaluate a joint model of longitudinal measurements of child weight and height data in various levels of missingness using a simulation study. Methodology A joint Bayesian model is applied with a fractional polynomial to capture the nonlinear structure of child weight and height. A shared random-effects model is proposed to incorporate the correlation structure of weight and height. Markov chain Monte Carlo sampling is used to carry out Bayesian posterior computation. The methodology is illustrated with simulated data of child weight and height <5 years according to WHO child growth standards. We introduced various scenarios of missingness e.g. 10%, 20%, 30% to evaluate the impact on predictions from joint Bayesian model. Results We successfully applied joint Bayesian modelling and demonstrated that this approach modelled child height and weight data very well — based on visual model fit assessments. The performance of joint Bayesian model was unaffected when we introduced 10% missingness at random for child height and weight at various ages. Conclusion Joint Bayesian modelling approach is feasible for modelling growth data and incorporates correlation between measurements. In longitudinal studies, it can be used in the case of missing data for two or more correlated variables of interest. Further work will evaluate performance of joint Bayesian model under extreme cases of missing data and its impact on prediction

Keywords: Joint modelling, correlated measurements, longitudinal data, missingness, height, weight, Bayesian



Presentation number: 08

GUIDANCE FOR INTERNATIONAL GROWTH STANDARDS: A SUITE OF STATISTICAL PACKAGES FOR CONSISTENT GROWTH ANALYSES USING INTERNATIONAL STANDARDS

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Understanding how and why child growth patterns change is necessary to characterize global health inequalities. Sustainable Development Goal (SDG) 3.2 aims to reduce preventable newborn deaths by at least 12 deaths per 1,000 live births and child deaths to 25 per 1,000 live births by 2030. However, large gaps remain in achieving these goals: currently 59 and 64 (of 194) countries will miss the targets for child and neonatal mortality, respectively. Infant mortality is associated strongly with non-optimal growth. Therefore, accurate growth assessment using international prescriptive growth standards is a key step towards efficient, accurate, and comparable tracking of progress towards achieving the SDGs. Different growth standards exist and can lead to differences in growth estimates due to lack of comparability as a result of how they were constructed (prescriptive vs descriptive approaches), study design, statistical methodology, etc. Growth of preterm and term infants should be assessed against a respective standard of optimal growth. The WHO GS describe optimal growth in term babies. These standards were not gestational age specific, and INTERGROWTH-21st aimed to fill this gap by developing gestational age- and sex-specific standards for size at birth in babies from 24 weeks' gestational age. In addition, INTERGROWTH-21st developed postnatal growth standards for preterm infants. However, guidance on transition between the WHO and INTERGROWTH-21st standards is unclear and has implications for growth assessment. To facilitate standardized growth assessment, the Guidance for International Growth Standards (GIGS) project has developed a suite of statistical packages in R, Stata, and SAS. These packages simplify accurate application of the WHO Child Growth Standards and growth standards from the INTERGROWTH-21st project. This talk will introduce the GIGS packages and their functionality for standardized growth assessment in R, Stata, and SAS.

Keywords: Growth standards, INTERGROWTH-21st, WHO child growth standards, Guidance for International Growth Standards



Presentation number: 09

MIXED METHODOLOGY TO ASSESS THE RELATIONSHIP BETWEEN MULTIPLE ENDOCRINE DISRUPTING CHEMICALS AND HUMAN GROWTH AND DEVELOPMENT

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There is an association between dysregulation of the endocrine system in humans and exposure to specific toxicants identified by the U.S. Environmental Protection Agency. Much human exposure is from chemicals in waste dumps and chemical processing, compounded by exposures through personal use products and ingestion of contaminated food and water. Many current and past studies do not account for this multiplicity of exposures. This study will analyse data from the New Bedford Cohort (NBC) to test the effect of multiple toxicant exposures on size and growth trajectories from birth to age 15, as well as age at menarche and Tanner stages. The NBC includes 788 mother-infant dyads recruited at birth from four communities around New Bedford Harbor, Massachusetts. Known toxicants include heavy metals and multiple persistent organic pollutants. For a subsample (N = 144) there is also information on parabens, phthalates, and phenols. Preliminary analyses will determine the most highly associated exposures to be used in Bayesian Kernel Machine Regression (BKMR). BKMR tests mixture groups (different combinations of toxicants) and relationships to characterize the relationship between exposure and outcome. BKMR will show: 1) a comparison of the mixture groups identified for their strength of association, and 2) posterior inclusion probabilities (PIPS), which display the exposures by component groups, showing associations of the toxicants within each selected component group. By displaying conditional relationships among exposures, BKMR will allow for an examination of how the toxicants in multi-toxicant models interact, and how component groups vary between outcomes. I hypothesize that different mixture groups (i.e., androgenic, estrogenic, anti-androgenic, anti-estrogenic) are associated with different growth and maturation outcomes.

Keywords: endocrine disrupting chemicals, persistent organic pollutants, multi-toxicant exposure, pubertal development, growth, environmental influences



Presentation number: 10

RELATIONSHIP BETWEEN BEHAVIOURAL IMMUNE SYSTEM AND FREQUENCY OF PROXIMITY CONTACTS AMONG SECONDARY SCHOOL STUDENTS

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Recently there has been much research regarding the extent to which behavioural immune system (BIS; behavioural responses related to avoidance of communicable diseases) is related to a variation in terms of social profile and personality traits among individuals. Studies suggest that BIS is a genuine psychological adaptation developed through evolutionary processes to minimize the risk of infection. However, most research on the relationship between BIS and sociality are based on short-term experimental studies and thus little is known about the degree to which BIS is related to the frequency of day-to-day proximity contacts. We used data obtained from secondary students ($n=53$, age 16-18yo, n schools/classes=2) to determine whether the variation in BIS values is associated with frequency of proximity contacts. Proximity data were derived from sensors registering proximity of other classmates within 2m radius. Students belonging to the same class were wearing the proximity sensors within the school environment for the period of 4 weeks. BIS activity was assessed using a total score of Perceived Vulnerability to Diseases (PVD) questionnaire. We used regressions with proximity as a dependent variable and PVD as predictor. We show that individuals exhibiting higher PVD values had higher proximity contact rates compared to individuals with lower PVD values, but only in males. Our preliminary findings do not support assertions of previous studies positing that BIS activation exhibited by higher PVD values are related to lower rate of face-to-face interactions. Our data suggest that it might be an exposure to high frequency of close-range social contacts that activates BIS mechanisms (rather than the other way round) mitigating potential risks related to contracting infectious diseases spread through close face-to-face contacts. We suggest that caution should be taken while inferring data obtained from short-term experimental studies to actual patterns in social contacts.

Keywords: proximity, disease avoidance, immune system, sociality



Presentation number: 11

THE 'MUSCLE-BONE UNIT' FROM CHILDHOOD INTO EARLY ADULTHOOD: A SITAR NONLINEAR GROWTH MODEL

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One approach to modelling nonlinear longitudinal data is to fit Super Imposition by Translation and Rotation (SITAR) models. Using data from the paediatric bone mineral accrual study (PBMAS, 1991-2017) we have shown that during adolescence, bone development is driven by muscle development. We have not explored if this relationship continues into early adulthood. The aim of this study was to create bone and lean mass development curves for individuals from 8 to 40 years of age. Methods: PBMAS, initiated in 1991, recruited 251 children aged 8-15 years. Participants underwent up to fifteen annual DXA scans (Hologic QDR-2000) until 2017 when values for total body Bone Mineral Density (BMD) and lean mass (LM) were recorded. 112 males and 127 females with ≥ 1 bone and lean mass measure are included in this analysis. SITAR models were fitted with manually selected knots with number and position informed by the cohort-specific model. All analyses were performed in R version 4.0.2 (R Project for Statistical Computing) and RStudio integrated development environment version 1.3.1 (RStudio Team). Results: Models showed rapid increases in both LM and BMD in adolescence, plateauing in adulthood. Age at peak LM and BMD accrual in girls was 11.7 yr. (4.9 kg/yr.) and 13.0 yr. (0.06 g/m²/yr.) respectively, compared to boys whose were 13.7 yr. (9.6 kg/yr.) and 14.4 yrs. (0.07 g/m²/yr.). From peak bone mass and 35 yr. age LM increased by 9% in girls and 1% in boys compared to an increase in BMD of 9% in girls and 8% in boys. Discussion: These models graphically illustrate the nonlinear development of bone and lean mass across the life-course and show sex and tissue differences in both velocity trajectories and magnitude of change. Peak adolescent accrual of lean mass precedes BMD. From peak to 35 yrs. percentage increases in tissues are similar in girls but not boys. These results continue to illustrate the strong relationship between muscle and bone from adolescence through to early adulthood.

Keywords: non-linear models, bone, lean mass, adolescence, growth



Presentation number: 12

A PHOTOANTHROPOMETRIC STUDY: A COMPARISON OF FACIAL INDICES DERIVED FROM PROFESSIONAL AND NON-PROFESSIONAL PHOTOGRAPHS

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Objectives. There are facial studies including professional photographs, however, studies investigating non-professional photographs are lacking. It is important to find out if non-professional photographs could be relevant for longitudinal facial analysis, as it could allow to perform such studies cheaper and save time. The aim of this study was to compare indices obtained from professional and non-professional photographs with anthropometrically determined indices. **Methods.** Faces (in frontal view) of 18–21-year-olds (35 males, 39 females) were measured by direct anthropometry and photographed using a standard protocol (professionally). In addition, non-professional frontal photographs of the same individuals were collected. Craniofacial landmarks were superimposed on all photographs in the frontal plane. Ten facial parameters were measured in total, 25 facial indices were calculated. Indices obtained from direct anthropometry and from both types of photographs were compared. **Results.** Fourteen of 25 (56%) facial indices did not differ in males and 10/25 (40%) in females ($p > 0.05$) between those obtained from direct anthropometry and from professional photographs. Comparison of direct anthropometry with non-professional photographs revealed that 8/25 (32%) indices did not differ in males and 7/25 (28%) — in females. These mostly contained vertical parameters and eye measurements. Comparing professional and non-professional photographs, it turned out that 16/25 (64%) of indices in men and 8/25 (32%) in women did not differ. **Conclusion.** In both types of photographs, indices including vertical facial dimensions and eye measurements were mostly consistent with those obtained from direct anthropometry. These parameters can be used interchangeably between photographs and direct craniofacial measurements and may therefore be suitable for longitudinal facial analysis using non-professional photographs.

Keywords: Anthropometry; craniofacial compartment; facial indices; photo-anthropometry, professional photographs, non-professional photographs



Presentation number: 13

NEUROENDOCRINE TRANSDUCTION OF SOCIAL-ECONOMICPOLITICAL-EMOTIONAL (SEPE) FACTORS THAT REGULATE HUMAN SKELETAL GROWTH

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There is renewed research focus on the regulation of human growth via biocultural interactions between community networks and hormonal physiology. Human communities are networks of Social-EconomicPolitical-Emotional (SEPE) factors. SEPE factors can enhance or diminish feelings of love and hope, which in turn can promote or delay skeletal growth. This presentation extends previous research (DOI: 10.1186/s40101-023-00330-7) on the physiology of the SEPE factors 'love and hope'. The scientific study of love and hope is possible via pathways that transduce Social-Economic-Political factors that structure human communities into Emotional factors (the SEPE infrastructure). There are several neuroendocrine pathways by which love and hope create measurable hormonal substances that regulate skeletal growth: 1) the hypothalamic-growth hormone-insulin-like growth factor-I pathway; 2) the hypothalamic-adrenalstress hormone pathway; 3) the stress hormone—osteocalcin pathway; 4) the hypothalamic-oxytocin-bone formation pathway. Human examples of neuroendocrine transduction from love, hope, and other SEPE factors to skeletal growth regulation are: 1) civil war in Guatemala, 2) international migration, 3) the 2008 banking crisis, and 4) winner-loser effects in status competition.

Keywords: Biocultural, SEPE, Community effects, Strategic growth



Presentation number: 14

SECULAR GROWTH OF HEIGHT FROM IMPERIALISM TO DEMOCRACY: THE IMPACT OF POLITICS ON LONG-TERM TRENDS IN HEIGHT OF GERMAN CONSCRIPTS

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Background: Average body height of European male populations varies between just over 160cm reflecting bare survival under extreme constraints, and 184cm under optimal nutritional, economic and social conditions. Genetic heterogeneity adds within-population variation, but the extent to which these factors ultimately contribute to height is still controversial. Contrasting the broad overall height variability, height standard deviations of local samples never exceed 7cm. Material: Annual height of more than 12 million German conscripts and recruits born between 1865 and 1975 was related to the independent variables GDP, income inequality, wealth distribution, domestic agricultural production, meat consumption, infant mortality, birth rate, %female students and population density. Results: Average German male height increased from 166cm to 180cm during the last century. Similar trends with high correlations to each other were found among the independent variables. Significant reduction of height variance by about 75% was caused by the height of immediately preceding birth cohorts (community effects). After the collapse of rigid state authority (1918, 1945, 1989), dynamic adjustments in average height occurred with increases of up to 4 mm/year, independent of nutritional and economic factors. Conclusion: The strongest driver of secular trends in body height is the collapse of rigid political power structures.

Keywords: Community effect on height, strategic growth, secular trend, political power structure



Presentation number: 15

CHANGES IN NUTRITIONAL STATUS AMONG WOMEN AND INFANTS AGED 6-23 MONTHS BEFORE AND AFTER THE COVID-19 PANDEMIC IN LOW-INCOME AREAS OF TWO CITIES IN PERU

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Background: Peru has made significant progress in the reduction of stunting and undernutrition in children. However, malnutrition persists with high rates of anaemia, overweight and obesity and stunting. We aimed to assess whether the changing conditions over the course of the COVID-19 pandemic (lockdowns, unemployment, access to healthcare) led to changes in maternal and infant and young child (IYC) nutritional status over this period. **Methods:** A nutritional and anthropometric survey on mothers and IYC aged 6-23 months (n=244) was conducted prior to the COVID-19 pandemic (January-March 2020) in low-income peri-urban areas of Huánuco city and Manchay in Lima. A second cross-sectional survey of mother-infant dyads (n=253) was carried out 2 years later (February-April 2022). Height, weight and haemoglobin (Hb) were assessed. Hb values from Huánuco were adjusted for altitude (~1900 m). Anaemia cut points were <105 g/L for 6–23-month-olds and <120 g/L for non-pregnant women (WHO, 2024). **Results:** In mothers, univariate analyses showed no change in BMI, but mean Hb was lower (122 g/L vs. 126 g/L, $p<0.001$) and anaemia prevalence higher (38.5% vs. 26.1%, $p<0.003$) pre- compared to post- pandemic. Overweight and obesity prevalence was similar in both surveys, but obesity prevalence was higher post-pandemic (20.4% vs. 28.1%, $p<0.05$). Among IYC, mean Hb was lower (104 g/L vs. 107 g/L, $p<0.001$) and anaemia prevalence higher (51.6% vs. 40.3%, $p=0.011$) pre- compared to post-COVID-19. All other indicators remained similar (height-for-age and weight-for-length z-scores; prevalence of stunting, underweight and risk of overweight). **Conclusions:** Despite negative impacts of the pandemic in Peru, maternal and child nutritional status pre- and post-COVID-19 was relatively stable, with higher mean haemoglobin and lower anaemia prevalence in both mothers and infants post-COVID-19. The increase in maternal obesity prevalence, however, may indicate a negative trend in nutritional outcomes.

Keywords: Peru, nutrition, child growth, anaemia



Presentation number: 16

A RETROSPECTIVE STUDY TO UNDERSTAND THE IMPACT OF FLOOD EFFECTED ENVIRONMENT ON POST-NATAL GROWTH AND NUTRITIONAL STATUS

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Flooding is one of the most devastating natural disasters that has overwhelming impacts on communities around the world, resulting in loss of life and severe disruption to national economies. Perennially, it impacts millions of people across Assam (one of the states of India), including one of the riverine tribal populations of Assam named Mishing. Though the Mishing population has tried to adapt physically as well as culturally through cohabiting with this natural disaster, the interplay between the impact of the flood and physical growth is yet to be understood properly. 1464 boys and 1506 girls were investigated through a cross-sectional study to understand the impact of the flood-affected environment on growth parameters, particularly the differential timing and tempo of height growth following the Preece and Baines Growth Curve Model-1. 1353 boys and 1399 girls (6–19 years) were considered to understand their nutritional status as per the WHO 2007 height-for-age reference. Individual Z-score values were calculated following the LMS method (Cole and Green, 1992) and categorized to represent normal, moderate, and severe cases of malnourishment. Further, the impact of differential fertility and mortality on selection intensity, particularly at different phases of life, was investigated through Sikdar's index (2012). Mathematical parameters estimated by the Preece and Baines Model-1 showed no differences in final height (h_1), peak height velocity size ($h\theta$), age at peak height velocity (APHV), or peak height velocity PHV (cm/y) between the subjects living in two different environmental setups. No significant differences in nutritional status (Z score) were found between the two setups. Sikdar's index showed differential selection intensity, highlighting the significant impact of the flood-affected environment until the infant stage through differential mortality, resulting in an attenuation of variability in physical growth and nutrition during the adolescent period.

Keywords: Flood, post-natal growth, nutritional status, infant mortality



Presentation number: 17

INTERGENERATIONAL CHANGES IN BODY HEIGHT, BODY MASS, AND BODY MASS INDEX IN SLOVENIAN POPULATION: SECULAR TREND OR AGE-RELATED CHANGES?

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Objectives: Secular trends in body height have been proved indicative of socio-economic development of a country or a region, as well as of childhood and adolescent (mal)nutrition. Taller body height was associated with enhanced longevity and several related factors involved. While basic anthropometric measurements, including body height, have long been performed in developed societies, primarily in men and children, far less data are available for adults and women in particular. The aim of the present cross-sectional study was to collect basic anthropometric data related to the assessment of nutritional status of adult population, to establish normative anthropometric data, and provide intergenerational analysis for height, body mass, and body mass index (BMI) of adults of both sexes. **Subjects and methods:** From March 2017 to April 2018 body height and body mass data of the more than 800 participating volunteers were collected by trained interviewers during home visits. BMI and sex-related percentile values were calculated, and percentile curves constructed. The protocol of the study was approved by the Medical Ethics Committee of the Republic of Slovenia. **Results:** Weighted percentile values (3, 5, 10, 15, 25, 50, 75, 85, 90, 95, and 97) for body height, body mass, and BMI were calculated, as were the non-weighted percentile curves for these parameters for both sexes. Secular trends and age-related height loss of the reported parameters will be discussed. **Conclusion:** The reported percentile values provide an insight into the secular trend of body height, mass, and BMI of an understudied population, i.e. adults of both sexes in a transitional society. As such, they can be useful to researchers, ergonomic professionals, health program coordinators, and policy makers.

Keywords: anthropometry, SI. Menu 2017/18, percentile values, centile values, population reference data, secular trend, age-related height loss



Presentation number: 18

HIGH PREVALENCE OF STUNTING AMONG SANTAL ADOLESCENT BOYS OF PASCHIM MEDINIPUR, WEST BENGAL, INDIA.

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Background: Adolescent undernutrition is a major human development concern in developing countries. Objective: The present study was carried out to assess the prevalence of stunting among Santal adolescent boys aged 10-18 years of Paschim Medinipur, West Bengal, India. Materials and methods: A total of 460 adolescent boys aged 10 to 18 years of Paschim Medinipur, West Bengal, India, were measured. Height (cm) and weight (kg) were measured using standard techniques. Data analysis was carried out using Statistical Package for Social Sciences (SPSS) version 16.0. Nutritional status was evaluated by calculating the Z-score using the standard formula. The studied participants were classified as stunted if the height-for-age Z-score was < -2 standard deviations (SD) from the reference standard of the World Health Organization (WHO). One-way-ANOVA was performed to assess differences in mean height, weight and body mass index (BMI) between different age groups. Findings: The overall prevalence of stunting was 38%. The highest (50.0%) and the lowest (26.5%) prevalence of stunting were found among 15 years and 13 years, respectively. Significant age group differences ($p < 0.001$) were observed in mean height, weight and BMI. Conclusion: As per WHO classification of severity of malnutrition, the overall prevalence of stunting was high (30-39%) which indicated a serious nutritional situation. Appropriate targeted nutritional intervention programs are required to ameliorate this health burden.

Keywords: Undernutrition, Santals, adolescents, stunting



Presentation number: 19

NUTRITIONAL CHALLENGES AMONG IMMIGRANT KYRGYZ CHILDREN IN ULUPAMIR VILLAGE, TÜRKİYE

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Migration, influenced by various macro and micro social, economic, political, and demographic factors, constitutes mass population movements that induce social changes. As a result of this population movement, among migrating population undoubtedly, children represent the most vulnerable group affected by migration. The Kyrgyz Turks are one of the oldest Turk communities with a nomadic lifestyle in the Central-Asia since the 2nd century. The struggle of the Kyrgyz Turks, especially those residing in the Pamir region, reflects the complexities of forced migrations and adaptive challenges with Russian invasions. Kyrgyz Turks from the Alay Region migrated to various territories, including Tajikistan's Pamir region, Afghanistan, and eventually to Türkiye. Present study evaluates the growth patterns and nutritional status of Kyrgyz children -150 children and adolescents aged 3-18 years- in Ulupamir village, Türkiye. Anthropometric measurements were taken, dietary intake and socio-economic indicators were collected. Findings reveal a high prevalence of stunting, underweight, and thinness, indicating significant malnutrition challenges within the community. The prevalence of stunting was 2.5% in boys and 5.6% in girls, while underweight affected 11.9% of boys and 13.9% of girls. Factors such as low socioeconomic status and inadequate nutrient consumption contribute to these issues. Risk factors identified include age, daily iron consumption, and meal skipping. Inadequate consumption rates varied for all energy and nutrients, with notably high rates observed for vitamin D, vitamin E, and vitamin C. Significant differences in insufficient consumption rates were observed among protein, vitamin C, B1, B2, B12, and vitamin A across age groups ($p < 0.05$, $p < 0.001$). Despite limitations, the research provides crucial insights into the complex dynamics of malnutrition among Kyrgyz Turk immigrant children community.

Keywords: Immigrant children, Nutritional assessment, Kyrgyz, Turkey



Presentation number: 20

IS A BODY SURFACE AREA A GOOD PREDICTOR OF MATURITY STATUS AMONG SCHOOL CHILDREN AND ADOLESCENTS

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Biological maturation is an important and complicated process leading to highly organized, specialized and mature state of organism. Although there are many indicators that measure maturity status, such as those based on skeletal age or secondary sexual characteristics, most of them are impractical and invasive. On the other hand, maturity offset equations proposed by Mirwald and Moore have been one of the most widely used non-invasive techniques. More recently, however, a body surface area (BSA), which changes significantly during each stage of growth and maturation, has been proposed as a reliable indicator of maturity status. The aim of the present study was to compare whether BSA was a better predictor of maturity status compared to maturity offset equations. Three separate longitudinal studies were conducted using age at peak height velocity (APHV) as an indicator of maturity status. In order to estimate an APHV, a SITAR model was applied separately into three series of longitudinal data. BSA was assessed using the equation of Haycock (1978). In addition, maturity offsets were calculated using the Mirwald's and Moore's equations. Separate regressions for each sex and study between APHV, as a dependent variable and BSA and maturity offsets were applied. Coefficients of determination R^2 and root mean square errors (RMSE) were compared between different regressions. Overall, the results of this study show that the BSA is not a better predictor of maturity status compared to maturity offsets.

Keywords: maturation status, APHV, maturity offset, SITAR, body surface area

ABSTRACTS OF POSTER PRESENTATIONS





Presentation number: EAA 01

CDKN2B – A GENE AT THE CROSSROADS OF LONGEVITY-RELATED PATHWAYS

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CDKN2B is a tumour suppressor gene encoding p15INK4B, an inhibitor of cyclin-dependent kinases that plays an important role in cell cycle regulation and senescence. It is located near the chromosomal region 9p21.3 that in other studies showed association with risk for coronary heart disease, as well as with longevity and parental lifespan. This study aims to explore whether rs4977756 and rs1333049 — two variants from this region reported by functional analyses to affect CDKN2B — influence longevity and late-life survival in the Croatian population. In a sample of 314 Croatians aged 85 and over, 43 single nucleotide polymorphisms (SNPs) associated with longevity in other studies were genotyped. The effect of two CDKN2B variants on longevity was tested using univariate logistic regression, while the impact on survival, both for the CDKN2B variants individually and for SNP-SNP interactions with other variants, was tested using Cox regression analysis. We did not detect a significant effect of rs4977756 and rs1333049 on chances for achieving longevity (90+ years), and individually neither significantly affected survival. However, the tested SNPs had a significant impact on survival above 85 years of age in interactions with variants of the TP53 (rs1042522) and FOXO3 (rs4946935, rs12206094, rs13217795, rs2764264) genes, as well as with the rs2149954 variant of the LINC02227 gene, which was previously also associated with risk for cardiovascular disease. Although it is possible that our sample size was too small to detect an effect on longevity, analysis of the genetic interaction of two variants enabled detection of an effect on survival beyond 85 years. Moreover, these effects were shown to be independent of the participants' health status. These results indicate that CDKN2B plays an important role in crosstalk between different pathways involved in longevity, such as DNA repair and cell cycle regulation, as well as the insulin signalling pathway.

Keywords: Longevity, Survival, Genetic interactions, Oldest-old, SNP



Presentation number: EAA 02

DOES BREASTFEEDING HAVE AN IMPACT ON THE TEETHING PROCESS?

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Background and aim: The eruption of the first tooth is influenced by various factors, including genetics, sex, and birth parameters. The objective of this study was to investigate whether the method of feeding during the first few months of life has an impact on the process of tooth eruption in children aged 2-4 years. Material and methods: The study included 164 children (81 boys and 83 girls) aged 2-4 years. It was conducted in randomly selected nurseries and kindergartens in Lodz, a city in central Poland. Parents completed a questionnaire regarding the type of feeding in the first months of a child's life. Additionally, participants were queried about the month in which their first tooth emerged. Results: The U Mann Whitney test showed that breastfed children had earlier tooth eruption ($Z = 2.180$; $p = 0.0293$). This relationship was observed in boys ($Z = 2.465$; $p = 0.0137$), but not in girls ($Z = 0.522$; $p = 0.6018$). The results of the multiple regression confirmed that the longer children are fed in a mixed way, the later they teethed (Beta = 0.300; $p = 0.0079$). This relationship was observed also in girls (Beta = 0.342; $p = 0.0310$). Conclusions: Breastfeeding may accelerate the teething process, while mixed feeding may delay the eruption of the first milk tooth.

Keywords: nutrition, teething process, children



Presentation number: EAA 03

RELATIONSHIP BETWEEN BONE MINERAL DENSITY, FAT MASS, AND FAT-FREE MASS IN OBESE AND NON-OBESE YOUNG ADULT WOMEN

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The present study investigated the relationship between fat mass (FM), fat-free mass (FFM), and bone mineral density (BMD) in young adult women from Slovakia. The study included 508 healthy young women aged 18 to 30 who underwent body composition and BMD measurements using the InBody 770 bioimpedance analyser and the Quantitative ultrasound device Sunlight MiniOmniTM. The participants were divided into two groups, defined by their percent body fat (PBF) in obese $PBF \geq 28\%$ and non-obese $PBF < 28\%$. Spearman correlation analysis was used to test the associations. The results showed a significant negative correlation between speed of sound (SOS) and FM ($r = -0.141$, $p = 0.042$), visceral FM ($r = -0.139$, $p = 0.044$), FFM ($r = -0.143$, $p = 0.039$), and lean body mass in the left arm ($r = -0.152$, $p = 0.027$) in obese women. In contrast, a positive correlation between SOS and PBF ($r = 0.121$, $p = 0.036$) and FM in the left arm ($r = 0.115$, $p = 0.049$) was observed in non-obese women. Analogue results were also observed between Z-score values and the same body composition parameters in both groups. In conclusion, we suggest that higher values of FM-associated parameters are associated with a lower BMD and worse bone quality in obese women. On the other hand, FM is associated with a higher BMD and, thus, better bone quality in non-obese women. Funding: Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic (KEGA 046UK-4/2023).

Keywords: Bone health, fat mass, fat-free mass, bone density



Presentation number: EAA 04

THE INFLUENCE OF GRAVITY ON THE MEASUREMENT OF FACIAL SOFT TISSUE THICKNESS WITH A NON-INVASIVE ULTRASOUND DEVICE

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Data on facial soft tissue thickness (FSTT) is currently widely used in forensics and medicine. It forms the basis for craniofacial reconstruction and identification methods. This study was conducted to evaluate the differences in FSTT between measurements in upright and horizontal/supine positions in living subjects. The analysed sample consisted of 127 participants aged 17 to 86 years from Slovakia. Information on biological sex and age was collected. Eight anthropometric landmarks in the medial line and nine bilateral landmarks in upright and horizontal/supine positions were used to measure FSTT using a non-invasive General Electric LOGIQe R7 ultrasound device. It was found that the position of the measured participant influenced more than half of the measured landmarks ($p < 0.05$), while the differences in the mean values did no more than 1.31 mm. Most FSTTs achieved higher values in the supine position. In the analysed group, regardless of sex and age category, only the glabella, supramental, pogonion and canine fossa landmarks showed greater FSTT values in the upright position, with the largest difference in the canine fossa landmark, where it reached 1.10 mm. Other landmarks showed significantly larger values in the supine position, ranging from 0.11 mm for the metopion landmark to 0.84 mm for the infraorbital landmark. The present study contributes to the current research on FSTT by demonstrating the differences in FSTT values depending on the measured position in the Slovak population using the non-invasive ultrasound method. The results of the study show that it might be more useful for facial reconstruction to use measurements on living individuals in an upright position, as FSTT changes both negatively and positively in the measurement positions. Funding: Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic (KEGA 046UK-4/2023).

Keywords: forensic anthropology, upright position, supine position, facial reconstruction, ultrasound



Presentation number: EAA 05

SELF-REPORTED LACTOSE INTOLERANCE IS ASSOCIATED WITH IMPAIRED BONE TISSUE QUALITY IN HEALTHY YOUNG WOMEN

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This study investigates the relationship between the self-reported lactose intolerance (LI) and bone mineral density (BMD) in the radius forearm bone in young women from Slovakia. We assessed 508 Slovak young women aged 18 to 30 years, divided into subgroups on their LI status, of whom 89 (17.52%) were women with LI and 419 (82.48%) without LI. BMD defined by speed of sound (SOS) and Z-score, was analysed by the QUS device (Sunlight MiniOmni™). Regression analysis tested the associations. Our results showed that women with LI had significantly lower SOS and Z-score compared to women without LI (4052.56 ± 105.03 vs. 4080.76 ± 111.93 , $p = 0.031$; -0.43 ± 1.03 vs. -0.16 ± 0.98 , $p = 0.048$, respectively). Finally, regression analysis detected the greatest influence of age, total weight and LI on the SOS and Z-score. Negative values of the B coefficient indicated that the presence of LI ($B = -26.936$; $p = 0.034$) and higher total weight values ($B = -0.853$; $p = 0.050$) were associated with lower SOS. Furthermore, the LI ($B = -0.266$; $p = 0.022$) and higher total weight ($B = -0.009$; $p = 0.029$) were associated with lower Z-score. In conclusion, we suggest that the self-reported LI is associated with bone tissue in the radius forearm bone and has a negative impact on bone health in young Slovak women. Funding: Cultural and Educational Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic (KEGA 046UK-4/2023).

Keywords: bone health, lactose, young women, food intolerance



Presentation number: EAA 06

OSSEOUS NON-METRIC VARIATIONS OF THE FEMORAL HEAD-NECK JUNCTION. POIRIER'S FACET IN THE SKELETAL POPULATION FROM RADOM (14TH-17TH AND 18TH-19TH CENTURIES)

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Osseous changes of the femoral head-neck junction have been the subject of anatomical and anthropological studies for many years. Among them, certain morphological features (Poirier's facet, Allen's fossa, femoral plague) have been considered. Disagreement on terminology and descriptions, poor knowledge of the variability and distribution of these traits and the absence of standardised scoring methods make it difficult to interpret their meaning. The aim of the study is to analyze the frequency of Poirier surfaces in the skeletal population from Radom (14th–19th centuries). Poirier's facet was analyzed on the femurs of 367 adult individuals (184 males, 140 females, 43 adults of unknown sex). In the late medieval population of Radom (14th–17th centuries), Poirier's facet lesions on the femurs were found in 33% of individuals, and in the skeletal series repeating the 18th–19th centuries, this percentage was 34%. In the analyzed skeletal group, the Poirier surface was usually observed on both femurs. A higher incidence of lesions was noted in 18th–19th century men compared to 14th–17th century men, while in women, Poirier's surface was slightly more frequently observed in 14th–17th century individuals. In Radom in the 14th–17th centuries, no statistically significant differences were found in the frequency of Poirier's surfaces between men and women (38% in men, 29% in women). In Radom from the 18th to 19th centuries, men were characterized by a significantly higher frequency (44%) of this change compared to women (18%). Due to the fact that the appearance of a Poirier's facet lesion on the femur is often associated with physical activity (work), the absence or presence of differences in the frequencies of this skeletal feature could be related to the absence/presence of differences in the type of physical activity. However, poor knowledge about the etiology of the Poirier surface, insufficient archaeological and historical knowledge about the lifestyle of the inhabitants of Radom and the small sample size from the 14th to the 17th century do not allow drawing clear conclusions. Further analysis is necessary.

Keywords: skeletal population, femoral head, femoral neck, changes of the femoral head-neck junction, Poirier's surface



Presentation number: EAA 07

STATURE ESTIMATION FROM MEDIEVAL JUVENILE SKELETONS USING LONG BONE LENGTHS

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Previous studies emphasize the impact of socioeconomic status, specifically its influence on chronic malnutrition and infectious diseases during critical periods of growth and development. Stature serves as a composite reflection of growth and development, often serving as a proxy for overall population health, both in contemporary populations and in the skeletal remains of historical populations. The present study aimed to assess the estimated stature of children and adolescents by examining long bone lengths. The sample comprises two medieval immature skeletal series aged between 1 and 17 years: The Dilkaya (n=90) skeletal collection from the East Anatolian Peninsula, and the Havuzdere (n=87) skeletal collection from the West Anatolian Peninsula. Femur and tibia lengths were used to predict stature using age-specific formulas, and crural indices were calculated. Stature estimates ranged from 54 cm to 162 cm. Dilkaya children appeared to be taller for most ages; at ages 8 and 12, predicted stature from tibia length was found to be statistically significant between archaeological groups ($p<0.05$). The population of Havuzdere has continued to live in isolation among Muslim groups after the conquest of Istanbul. It is known that they are particularly disadvantaged in terms of food intake due to their current socio-political position, and we believe that this situation also reflects on the height of children and adolescents. On the other hand, the population of Dilkaya is one of the popular trading areas in Eastern Anatolia, especially known for its rich resources in animal husbandry and freshwater fishing. This has also been reflected in the height measurements of the juvenile population.

Keywords: Stature estimation, child skeletons, Medieval archaeological population, Anatolia



Presentation number: EAA 08

OVERDIAGNOSIS OF CANCER; ANTHROPOLOGICAL PERSPECTIVE

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Before the 20th century, cancer diagnoses relied primarily on assessing patients' symptoms and physical findings, often resulting in late-stage diagnoses and dire prognoses. With limited medical accessibility and technical capabilities, cancer was often synonymous with imminent death. However, the advent of modern medicine and technological advancements has revolutionized cancer diagnosis, allowing for earlier detection through radiological and biochemical innovations such as CT scans, PSA tests, MRI imaging, and endoscopic procedures. Despite these strides in early detection, the deep-seated fear of cancer ingrained in human psyche persists into the 21st century. This disconnect between improved diagnostic capabilities and lingering fear has given rise to a modern medical dilemma: the phenomenon of overdiagnosis. This term describes the identification of cancers that may never progress to cause harm during an individual's lifetime, leading to unnecessary treatments and potential harm. In the current medical landscape, the clinical significance of early-stage cancers, many of which may follow diverse trajectories including regression, dormancy, or slow progression without symptoms or mortality, remains inadequately understood. Consequently, medical practices often treat these early-stage cancers with the same aggressive approaches as late-stage malignancies, such as radical surgical resection. Cancer screening programs, while aimed at early detection and prevention, inevitably contribute to overdiagnosis. The meticulous evaluation of these programs from an anthropological perspective is essential. Such an approach allows us to consider the cultural, social, economic, and political factors that influence perceptions of cancer, medical decision-making, and the allocation of healthcare resources.

Keywords: overdiagnosis, cancer screening, early detection



Presentation number: EAA 09

LIFESTYLE HABITS AND INFLUENCE OF SPORTS PRACTICE IN ITALIAN ADOLESCENTS: COMPARISON BETWEEN GIRLS AND BOYS

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Adolescence represents a phase of deep physical and psychological changes. Sports practice appears to have a positive influence on adolescents, thus also improving their body composition. This is especially relevant when we consider that obesity in adolescents is recognized as a global major public health problem. This study aims to understand the influence of sports practice on anthropometric measures in both sexes and whether lifestyle habits differed between sexes. The study was carried out on 239 students (146 boys and 93 females aged from 10.9 to 14.7 years) attending a middle school in Ferrara (Emilia- Romagna region, Italy). The survey took place in November 2023 and anthropometric variables (stature, sitting height, weight, waist circumference, skinfold thicknesses) were directly collected by an expert anthropometrist. Moreover, a trained operator asked questions regarding lifestyle habits (screen time, time spent studying, and sports practice). Years at peak height velocity (YPHV) and %F were calculated. The majority of the students practiced sports (69.5%), with a mean of $4.6 \pm (2.8)$ hours/week. In particular, emerged that boys practice more sports than girls (74.7% and 61.3%) and they trained more than females ($4.8 \pm (2.6)$ hours/week vs $4.0 \pm (3.3)$ hours/week). Girls spent more time in front of a screen in comparison to males ($2.9 \pm (1.7)$ hours/day vs $2.5 \pm (1.9)$ hours/day) and more hours per day studying ($2.2 \pm (1.1)$ hours/day vs $1.7 \pm (0.9)$ hours/day). The majority of the students were normal weight, but 28.7% of males and 28% of females were overweight or obese. The Two-way ANCOVA (adjusted for YPHV), analysing the effect of sports practice and sex on body size and body composition, revealed that, as expected, boys were taller, and heavier, with wider waist and upper arm circumference. On the other hand, sports practice positively influenced body fat regardless of sex.

Keywords: adolescence; growth; Italy; sports; anthropometry



Presentation number: EAA 10

CAN NOTHING MOTIVATE YOU? THE EFFECTS OF PLACEBO INTERVENTION ON FITNESS-RELATED PARAMETERS OF ADOLESCENTS WITH VARYING BODY MASS AND COMPOSITION STATUS - THE ROLE OF MOTIVATION IN PHYSICAL ACTIVITY

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The study aims to analyse the effects of placebo intervention on parameters related to physical fitness in participants aged 12-18 with varying body mass and body composition status. Data collection is ongoing. Up to this point, 31 adolescents (9 boys) underwent anthropometric measurements, body composition analysis and a beep test. They were randomized into experimental (a drink [placebo] presented as a beverage that enhances energy levels, strengthens muscles, and improves overall physical fitness) or control (participants were explicitly informed that they would be consuming water) groups. The researchers conducting the fitness test and obtaining physiological and morphological data were blinded to the study's true purpose. Physiological, behavioural and subjective parameters related to the exercise were obtained. Additionally, data regarding the motivation for physical activity (SMS-15, The Situational Motivation Scale) and declared level of physical activity (HBSC questionnaire) were collected. The analyses are still ongoing. Currently, no differences were observed between the groups regarding age categories, sex distribution, or anthropometric variables. There was a statistically significant effect of the placebo on the level of motivation to achieve the best possible results, $t(29) = -1.886$, $p = 0.035$. Control declared lower motivation levels ($M = 6.81$, $SD = 1.42$) than the placebo group ($M = 7.87$, $SD = 1.68$). There were no significant differences in initial and maximal heart rate ($p=0.225$), number of beep-test levels ($p=0.210$), maximum running speed ($p=0.210$), or recovery pace in phase I ($p=0.214$), phase II ($p=0.349$), and overall ($p=0.194$). Notably, trends favouring placebo were observed. The results suggest that a placebo may affect adolescents' motivation for high sports achievement. Thus, the placebo effect may be beneficial, especially for children with higher BMI or body fat [%BF], because physical activity can be particularly challenging for them.

Keywords: obesity, overweight, physical activity, motivation, placebo, children



Presentation number: EAA 11

NEW HOMO ERECTUS JUVENILE REMAIN FROM CHINA (LUANCHUAN, HENAN) AND THE MORPHOLOGICAL IMPLICATIONS OF DECIDUOUS LOWER SECOND MOLAR IN HUMAN EVOLUTION

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A new juvenile *Homo erectus* fossil has been uncovered in central China (Luanchuan, Henan province) from the Middle Pleistocene. This specimen, No.12SJD #1, is a deciduous lower second molar embedded in a fragment mandible, representing the only well-preserved *H. erectus* dm2 with stratigraphic records in China and even in East Asia. Therefore, it provides us with unique evidence of a juvenile East Asian *Homo erectus*. Through a broad comparative study of metrical and morphological features, we have demonstrated the characteristics of the Luanchuan dm2 and discussed the implications of the different traits in human evolution. The Luanchuan dm2 is similar to Zhoukoudian *Homo erectus* and demonstrates certain primitive characteristics such as a narrow crown (small crown index), buccal mesial groove on protoconid, lingual mesial groove on metaconid, and fine crests on hypoconid on EDJ. It also exhibits distinctive characteristics such as a basin-shaped anterior fovea and a special pattern on EDJ: dw with type 3 DTC. Additionally, the groove pattern Y6 and protostylid are common features with Asian *Homo erectus* and modern populations of Asia. Some of the primitive features are preserved in Holocene modern populations, such as the relatively narrow crown and talonid crest presented in the Houtaomuga neolithic and bronze age site.

Keywords: Middle Pleistocene, East Asia, *Homo erectus*, deciduous teeth, human evolution



Presentation number: EAA 12

BIOLOGICAL DISTANCES OF THE POPULATION OF THE ISLAND OF RAB, CROATIA, CALCULATED BASED ON ANTHROPOMETRIC MEASUREMENTS OF THE BODY AND HEAD

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One of the ways to assess the relationship between the studied populations is to determine their "biological distances". The most suitable measure for the assessment of biological distances based on continuous variables is the Mahalanobis distance D2 analysis. The sample included in this analysis consisted of 600 adults of both sexes, residents of five settlements on the island of Rab, Croatia (Rab, Banjol, Barbat, Supetarska Draga and Lopar). The aim of the research was to estimate the biological distances between these five populations, separately by sex and separately for each set of investigated variables (anthropometric variables of body and head). In order to assess which populations form groups according to the sets of investigated variables, we performed a cluster analysis using Ward's method and Mahalanobis distances. Clusters formed in the space of morphological dimensions showed the following: women from the city of Rab are distant from women from other island settlements in anthropometric measures of both head and body, while in men, head anthropometric variables separate the men from the city of Rab and body variables separate the men of Banjol from other populations of men on this island. Such a finding suggests the conclusion that even the partial isolation of some populations of the island of Rab, caused by evolutionary processes, resulted in a clear phenotypic differentiation of the group. The grouping of today's population communities from the island of Rab, based on the analysis of morphological characteristics, coincides with the known course of settlement of this island and the dynamics of island migrations of its population.

Keywords: isolated population, biological distances, anthropometry, island of Rab, Croatia



Presentation number: EAA 13

ABCC2 GENE POLYMORPHISMS ASSOCIATED WITH MULTIDRUG RESISTANCE IN CROATIAN ROMA

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The ABCC2 gene encodes the multidrug resistance-associated protein 2, MRP2, an ATP-binding cassette transporter that plays an important role in detoxification and chemoprotection, as it transports a phase II products of biotransformation (various compounds as glutathione, glucuronide, and sulphate conjugates). Some ABCC2 polymorphisms affect the pharmacokinetics of certain groups of drugs, and consequently the effectiveness of pharmacotherapy and the risk of adverse reactions in clinical practice. The Roma, a transnational minority present in many countries world-wide, are an example of a founder population that shares a common Indian origin, with persistent, centuries-old socio-cultural isolation. The genetic structure of Roma groups is strongly influenced by traditional endogamy. This research aims to determine the frequency of six single nucleotide polymorphisms (SNPs) of the ABCC2 gene in 440 subjects who belong to three sociocultural different and geographically distant Roma groups in Croatia. Genotyping was performed using the KASP method. Three SNP loci, rs56199535, rs56220353 and rs56296335, were monomorphic. Minor allele frequency (MAF) of rs3740066 was the highest in Međimurje Roma (48.8%), compared to Baranja (45.0%) and Balkan Roma (35.1%) ($p < 0.001$). MAF of rs717620 was also higher in Roma from Međimurje (39.3%) than in Roma from Baranja (26.5%), and in Roma from Zagreb (14.4%) ($p < 0.00001$). MAFs of rs2273697 did not significantly differ between the three Roma groups, but genotype frequencies did — the most heterozygotes were in the Međimurje Roma group ($p < 0.05$). The prevalence of alleles and genotypes in polymorphic ABCC2 loci differs between three Croatian Roma groups, presumably as a result of their reproductive isolation. Differences in MAF frequencies of rs3740066 and rs717620 between Roma and 1000 Genomes populations of European-origin suggest that adverse drug effects should be considered when administering MRP2 enzyme — mediated drugs.

Keywords: genetic variants, gene ABCC2, multidrug resistance-associated protein 2, pharmacogenetics, Roma population, Croatia



Presentation number: EAA 14

THE EFFECT OF ACUTE HYPOBARIC HYPOXIA TO BLOOD PARAMETERS OF INDIVIDUALS RESIDING IN LOWLAND AREAS OF THE JAPANESE ARCHIPELAGO

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Exposed to hypobaric hypoxia (HH), such as at high altitude, triggers hemodynamic adjustments to maintain oxygen levels in unadapted lowlanders. When changes in peripheral oxygen saturation (SpO₂) and heart rate are known, the effects of humoral regulations under HH conditions remain unclear. We examined blood endocrine, inflammatory, and immune parameters during acute HH exposure (75 min at 3500 m equivalent) in young men living in lowland areas of the Japanese archipelago using a climatic chamber. Aldosterone and cortisol decreased significantly, while interleukin (IL)-6, IL-8 and white blood cell (WBC) counts increased significantly after HH. Our findings indicate that even brief HH exposure elicits significant changes in blood parameters, with individuals exhibiting lower SpO₂ showing more pronounced responses. These results underscore the impact of SpO₂ on humoral regulations during acute HH in lowlanders.

Keywords: hypobaric hypoxia, environmental adaptation, individual variation, hemodynamics, cytokines



Presentation number: EAA 15

GENE POLYMORPHISMS AND DIVERSITY OF COLD-ADAPTATION IN HUMANS

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Humans would need to adapt to cold during their migration from Africa to Eurasia. Thermogenesis is considered to be indispensable for maintenance of body temperature in cold because humans do not have dense fur or firm subcutaneous fat like other mammalian species in high latitudes. In particular, brown adipose tissue (BAT) plays a role in non-shivering thermogenesis and their thermogenesis efficiency is considering high because BAT is mainly located in anatomically deep regions than the skeletal muscle, which is the main tissue of shivering thermogenesis. Genes involved in differentiation and thermogenesis functions of BAT have been reported by studies using model animals. However, mainly due to difficulties in evaluating BAT activity in humans, identifying genes that determine the diversity of the human BAT thermogenesis has not progressed. We assessed BAT activity of healthy East Asian adult men and women using different approaches including fluorodeoxyglucose-positron emission tomography and computed tomography (FDG-PET/CT) or infrared thermography (IRT) and evaluated the effects of genetic polymorphisms. Targeted loci included beta-adrenergic receptor genes, which have been shown to be functionally important in human BAT thermogenesis, and six BAT-related loci that showed traces of positive natural selection in high latitude populations. As the results, we found significant associations between single nucleotide polymorphisms (SNP) in beta 2-adrenergic receptor genes and BAT activity. In contrast, all of the SNPs that showed traces of positive natural selection were found not to be associated with BAT activity. These data provide new insights into the contribution of gene polymorphisms to cold adaptation via non-shivering thermogenesis in humans. We will further increase the number of genes to be analysed and discuss the potential of our research findings.

Keywords: brown adipose tissues, cold adaptation, thermogenesis, single nucleotide polymorphism, human genetics, human evolution, positive natural selection



Presentation number: EAA 16

TRANSCENDING BORDERS: ANTHROPOMETRIC INSIGHTS AND BODY IMAGE AMONG TURKISH MIGRANTS IN GERMANY AND THE NETHERLANDS

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Human migration phenomena, influenced by economic, political, cultural, and environmental factors, operate on “Push-Pull” dynamics. These migrations shape immigrant populations in behaviour, social dynamics, dietary patterns, growth trajectories, reproductive strategies, and overall well-being. Since the 1960s, Turkish immigrants have predominantly settled in Germany and the Netherlands. This study aims to understand changes in anthropometric variables among adult Turkish immigrants due to migration, also exploring the factors influencing their body image and height. A cross-sectional study was conducted, involving a random sample of 190 Turkish immigrants (75 males, 115 females) aged 18-65 residing in Germany and the Netherlands, alongside 278 non-migrant individuals (120 males, 158 females) living in Turkey. Anthropometric data including height, weight, circumferences, and skinfold thickness were collected, and a body image survey was administered. The collected data were analysed using the R Studio V4.3.1 practical interface, which employed Principal Component Analysis (PCA) to assess the relationship between anthropometric measurements and the Body Image Questionnaire. Results from linear regression models demonstrate the association between the dependent variable (Height) and independent variables (Body Image, Education, BMI). No statistical difference was found in the height of Turkish immigrants in Germany and the Netherlands compared to those in Turkey; however, being overweight was more prevalent among the immigrant groups. Comparisons between Turkish immigrants and non-immigrants showed higher body image scores among both European males and females. The absence of height differences between Turkish immigrants and individuals living in Turkey may stem from inadequate integration of immigrants into the new society. Nevertheless, it was observed that educational level positively influences the height of both sexes among Turkish immigrants and non-immigrants.

Keywords: Migration, Anthropometry, Height, Weight, BMI, Body Image, Turkish immigrants, Germany, the Netherlands



Presentation number: EAA 17

INCREASED FLUCTUATING ASYMMETRY OF X-RAY OSTEOMETRIC TRAITS OF FINGER BONES IN BEDOUIN MEN OF SOUTH SINAI

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Background: It's generally accepted that fluctuating asymmetry (FA) reflects the body's response to environmental stress. South Sinai Bedouin tribes live in extreme environmental conditions; it's logical to expect an increase in deviations from strict bilateral symmetry & disturbances in the regulation of ontogenetic processes. We aim to evaluate the level of fluctuating asymmetry using osteometry of phalanges radiographs in South Sinai adult Bedouin men versus that of Israeli Jewish men (control group). **Method:** Study of 70 radiographs of both hands for Bedouins (18–55 years) from a Sinai Expedition (79'– 82') using standard measurement techniques. Bone dimensions, epiphysis width & medullary canal parameters were studied for distribution & presence of directional asymmetry in both hands (thumbs excluded). For all bone traits fluctuating asymmetry value (per individual) was calculated (Formula: $FA(\%) = |(2(L - R) / (L + R))|$). If directional asymmetry was detected, adjustments were made to the measurements, & then averaged fluctuating asymmetry values were calculated for each trait. The comparative material was synchronous data on Israeli Jews of the same age category. To assess differences in fluctuating asymmetry, the Mann-Whitney test was used. **Results:** the analysis shows a statistically significant increase in fluctuating asymmetry scores compared to the Jewish data. Greater variability among Bedouins is typical for such parameters of the proximal phalanges of the fingers of the II & III rays of the hands the length & width of the bone, the width of the medullary canal, & the width of the epiphyses. **Conclusions:** Increased asymmetry fluctuation in Bedouin populations is consistent with the concept of fluctuating asymmetry as a measure of development instability under extreme conditions. However, it cannot be ruled out that the increase in fluctuating asymmetry is also facilitated by a high level of inbreeding in Bedouin tribes (Jewish population is panmictic).

Keywords: fluctuating asymmetry of x-ray osteometric signs of finger bones, extreme environmental conditions



Presentation number: EAA 18

INFLUENCE AND INTERACTION OF SPECIFIC ENVIRONMENTAL FACTORS ON THE IDENTIFICATION FEATURES OF LATENT FINGERPRINTS

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In dermatoglyphic and forensic practice, it is important to increase the knowledge about the influence of environmental factors on the identification features of latent fingerprints in order to increase the probability of positive personal identification of offenders. The aim of the study is to investigate whether there is a multifactorial influence of environmental factors on the quality of latent fingerprints, especially in the evaluation of minutiae (2nd level identification features). In this study, 1272 latent fingerprints exposed to snow, water, direct sunlight and forced placement of an object with latent prints in snow were examined. The frequency of minutiae on all latent footprints exposed to each environmental factor was assessed. Using a multivariate general linear model (GLM) with Bonferroni correction, we found a significant influence of each environmental factor on the number of minutiae evaluated on degraded latent fingerprints. The interaction of factors such as snow and direct sunlight, frost and direct sunlight, frost and forcible immersion of an object with latent fingerprints in snow significantly influenced the frequency of minutiae on latent fingerprints. Our results clearly show that the influence of environmental factors on latent fingerprints is multifactorial and significantly affects the identification feature (minutiae). These findings can contribute to how latent traces should be secured and used in forensics. This study was supported by the Cultural and Educational Grant Agency (KEGA 046UK-4/2023) of the Ministry of Education, Science, Research and Sport of the Slovak Republic.

Keywords: forensics, dactyloscopy, minutiae, latent fingerprints, multifactorial effect



Presentation number: ISGA 01

SECULAR TRENDS IN BODY COMPOSITION OF YOUNG ADULTS IN SLOVENIA

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Objectives: To determine secular trend in body composition (fat-mass, lean body mass) in young adults. **Methods:** Anthropometric data of young adults aged 20-25 years (N = 5303; males 1985, females 3318) from the Slovenian (data) Base of Anthropometric Measurements from 1960 to 2023 were used. Body mass index (BMI), waist circumference (C), and skinfold thicknesses (SFT; triceps, abdominal, thigh) were used to assess overweightness/obesity. Upper arm muscle area (UMA), calculated from upper arm C and triceps SFT, and thigh muscle area (TMA), calculated from thigh C and thigh SFT were used to assess lean body mass. Analyses of variance and multiple linear regressions were performed. **Results:** Over the last 63 years, positive secular trends ($p < 0.001$) were observed for body height (at present (in years 2020-23), males are on average 5.3 cm taller than in years 1960-69; females 4.5 cm) and for (abdominal) body fat accumulation. With regard to the latter, this was particularly evident from abdominal SFT ($B = 0.151$, $R^2 = 0.169$) in males and from waist C ($B = 0.111$; $R^2 = 0.107$) in females. Interestingly, average BMI has not changed significantly over time in females (change from 22.1 to 22.5 in six decades). In the same period, negative secular trend ($p < 0.001$) was observed in TMA in both sexes (males: $B = -0.427$, $R^2 = 0.000$; females: $B = -0.875$, $R^2 = 0.300$), and UMA in females ($B = -0.106$, $R^2 = 0.063$). **Conclusion:** A simultaneous increase in the accumulation of body fat, especially in the abdominal area, and a decrease in limb muscle mass in young adults over the past six decades is of great concern. As both factors increase health risks, immediate actions and lifestyle change interventions should be taken to reverse these trends. Furthermore, the results of the present study emphasize the importance of monitoring obesity with a measure such as waist C in addition to BMI, as BMI fails to exert sufficient sensitivity for detecting overweightness/obesity.

Keywords: secular trend, young adults, anthropometry, body fat, muscle area



Presentation number: ISGA 02

ASSOCIATIONS AMONG MATERNAL AND INFANT BODY COMPOSITION, FEEDING PRACTICES, AND PERCEIVED INFANT EATING BEHAVIOR IN SAMOAN MOTHER-INFANT DYADS AGED 2-4 MONTHS

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Samoa is a South Pacific nation experiencing rising obesity and related metabolic disease prevalence. Breastfeeding has been shown to reduce risks for the development of obesity in childhood and later adulthood. Initiation of breastfeeding rates is almost universal in Samoa; with around 90% of infants fed any human milk, but there is opportunity to improve the proportion of infants exclusively breastfed to 6 months (51.7%). Little is currently known about how Samoan mothers perceive infant appetite in breastfed infants, which has implications for early cessation of exclusive breastfeeding and introduction of solid foods and/or formula. Here we explore how different maternal and infant characteristics are associated with maternal perceptions of infant satiety among exclusively breastfeeding Samoan mother-infant dyads. We administered the Baby Eating Behavior Questionnaire (BEBQ) to n=100 mothers of exclusively breastfed infants aged 2-4 months alongside the collection of maternal and infant anthropometric and body composition measurements, human milk samples, information on breastfeeding practices, and maternal/household demographic characteristics. The five BEBQ constructs - Food Responsiveness (FR), Enjoyment of Food (EF), Satiety Responsiveness (SR), Slowness in Eating (SE), and General Appetite (GA) — were analysed using Pearson correlations for their associations with maternal and infant characteristics. We found that BEBQ constructs were correlated with infant age (-; SR & GA), area of residence (-; SE), infant weight-for-length Z-score category (+; EF), infant length-for-age Z-score category (-; FR), feeding routine (+; EF & GA, -; SR), average feeding bout length (+; SE & GA), and maternal confidence in milk quantity (+; EF). In conclusion, maternal perception of infant appetite appears to be influenced partially by infant body composition and breastfeeding patterns in our sample.

Keywords: Samoa; Breastfeeding; BEBQ; Body Composition; Breastfeeding Patterns



Presentation number: ISGA 03

METABOLOMIC INSIGHTS INTO ENVIRONMENTAL POLLUTION: IDENTIFYING BIOMARKERS AND MECHANISTIC PATHWAYS OF METABOLIC DISRUPTION

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Metabolomics research can be a valuable tool for identifying new biomarkers associated with exposure to environmental pollutants and for generating hypotheses that deepen our understanding of the mechanistic pathways related to metabolic alterations. In this review, we will examine data from significant studies that identify metabolites impacted by air pollutants such as metals, ultrafine particles, and particulate matter. We will investigate their mechanisms of action, the biochemical impacts they cause, the metabolic pathways they influence, and the potential diseases or adverse health outcomes that may result from exposure. Hypotheses based on observed data suggest that these metabolites could serve as indicators of specific toxic effects, aiding in the identification of exposure-related health risks. By providing a clearer picture of how environmental exposures influence metabolic processes, this review contributes to our understanding of the topic. Future research should focus on refining these biomarkers and pathways to develop targeted interventions and preventative measures that mitigate the health impacts of pollutants.

Keywords: Metabolomics, Environmental Pollution, Biomarkers, Mechanistic Pathways, Air Pollutants



Presentation number: ISGA 04

PREDICTION OF NEONATAL SURVIVAL AMONG PACIFIC ISLANDER PRETERM BIRTHS IN THE US

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Predicting neonatal survival is essential for targeting interventions to reduce neonatal mortality. Pacific Islanders have been underrepresented in existing prediction tools and have unique, maternal obesity-related risk factors for both preterm birth and neonatal mortality. Using neonatal sex, birth weight, and gestational age, we developed a graphical tool for neonatal survival among Pacific Islander singletons in the US. Birth-infant death data files from the US National Centre for Health Statistics for 2014-2018 were used. Pacific Islander mothers and singletons without congenital anomalies born between 22-36 gestational weeks were included. Poisson regression models were used to predict neonatal mortality (<28 days of life) rate including neonatal sex, birth weight, and gestational age in weeks as predictors. Predicted survival rates in the graphical tool were based on "1-mortality rate". Of the 5192 included neonates, the neonatal mortality rate was 2.0%; 43.5% of mothers had pre-pregnancy obesity, and 16.5% of neonates were born large-for-gestational age. Birth weight and gestational age had a non-linear association with neonatal death, and their interaction was included in the model. Retaining neonatal sex, models with gestational age at birth or both birth weight and gestational age at birth performed better than the model with birth weight only. This is the first graphical tool for neonatal survival prediction among preterm-born Pacific Islander singletons in the US. Using only neonatal sex, birth weight, and gestational age, this graphical tool is a straightforward reference for survival among groups of neonates with similar characteristics.

Keywords: Pacific Islanders; neonatal mortality; survival prediction; gestational age; birth weight



Presentation number: ISGA 05

ASSOCIATION BETWEEN URINARY PENTOSIDINE AND MUSCLE MASS AMONG YOUNG MALE UNIVERSITY STUDENTS: A PRELIMINARY STUDY

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Pentosidine is representative of cross-linked structure of advanced glycation end products (AGEs) and has been suggested as a biomarker to assess bone and muscle quality. As studies on pentosidine in young adult men are limited, we aimed to clarify the association between urinary pentosidine with musculoskeletal status and physical performance in young men. A total of 27 male university students (age range: 19-25 years) participated in this study. Anthropometric measurements (body composition by InBody 430), thigh muscle thickness by ultrasound, and urinary biomarkers (pentosidine) were measured. In the partial correlation analysis adjusted for age and height, higher urinary pentosidine levels were significantly associated with age and anterior thigh thickness. Our findings suggest that pentosidine is negatively correlated with a few muscle indicators. Therefore, pending future validations, urinary pentosidine may be a biomarker of AGEs for young men's health.

Keywords: pentosidine, anterior thigh thickness, young male university students



Presentation number: ISGA 06

ASSOCIATION BETWEEN MATERNAL AGE AND BIRTH SIZES IN BULGARIAN NEONATES

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Many factors influence the prenatal period, but parental factors (including morpho-functional status of mother and father, age, birth order, etc.) exert important significance. The aim of the study is to evaluate the influence of maternal age on the birth weight and length of neonates. Data of 1526 (799 boys and 727 girls) neonates born in 2020 and data of their mothers were collected from the birth registry of the Obstetrics and Gynecology Hospital "St. Sofia", Sofia. Only data of livebirth singleton infants were analysed by statistical software SPSS 16.0. Z-score transformation was applied to birth weight and length. One-way ANOVA analyses with post hoc Tukey Honestly Significant Difference Test were performed to assess the influence of maternal age on neonatal dimensions. The significance of the sexual differences is assessed by the t-test of Student ($p \leq 0.05$). The mean maternal age was 29.46 ± 6.17 years as only in the group of boys eight of the mothers (1.0%) were over 45 years of age. The highest percentage of mothers (31.2%) fall into the 30-34 age group, followed by mothers aged 25-29 (26.9%). The percentage of mothers over 39 years is the lowest (4.6%). Maternal age has a significant impact on the newborn body weight ($p=0.0001$) and body length ($p=0.001$). The neonates, whose mothers are between 25 and 44 years have birth sizes above and around the average (Z-score is between 0.02 and 0.16). Boys and girls born to mothers under the age of 20 are the smallest (Z-score is negative: -0.44). Their birth weight and length significantly differ ($p \leq 0.05$) from those of babies born to mothers of other age groups. The maternal age significantly affects the anthropometric characteristics of neonates. The babies born to older mothers (excluding the group 45+) have larger body sizes. Acknowledgments: The work was supported by the Bulgarian National Science Fund: Grant KP-06-H51/7 from 11.11.2021

Keywords: maternal age, birth weight, birth length



Presentation number: ISGA 07

JOINT MODELLING OF NON-TIME TO EVENT LONGITUDINAL DATA: ASYSTEMATIC REVIEW OF METHODOLOGY AND APPLICATIONS

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Background: In recent years, the application of joint modelling for longitudinal data has increased, especially for time-to-event data. Joint modelling has been shown to; a) reduce bias in parameter estimation, b) increase the efficiency of statistical inference by incorporating the correlation between measurements, and c) allow the borrowing of information in cases where there is missing data for one variable of interest. Most joint modelling methods and applications are on time-to-event data, focusing primarily on one continuous and one binary variable. However, in practice, there are two or more time-varying variables of great interest, and they have not been given much attention in joint modelling. Therefore, in this systematic review, we aim to summarise the current state of joint modelling of non-time-to-event longitudinal data to draw recommendations for future research. **Methods:** We will review current methodologies of joint modelling for non-time-to-event data for univariable and multivariable longitudinal data. The search will include five databases: Embase, Medline, Scopus, PubMed, and Web of Science. We will extract information on the application field, statistical methods, association structure, estimation methods, and software used. We will also identify gaps and challenges in the joint modelling of longitudinal data. **Results:** After searching the five electronic databases, we identified 1912 records that will undergo a screening process. From this screening, we will select eligible studies for further analysis. The approaches to modelling the non-time-to-event longitudinal data will be reported, mimicking the description provided in the methodology section. **Conclusion:** Joint modelling has been proven to accurately predict non-time-to-event longitudinal data. However, researchers are limited in their ability to fit these models. It is a promising area of research and requires further investigation.

Keywords: Joint modelling, longitudinal data, non-time-to-event outcomes



Presentation number: ISGA 08

A MACHINE LEARNING CLASSIFICATION MODEL FOR PREDICTING BIRTH OUTCOMES AND NEWBORN ANTHROPOMETRY IN THE CRIBS BIRTH COHORT- PROBLEMS OF UNBALANCED CATEGORIES

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In the past 20 years, there has been many studies with different models of machine learning widely used for prediction of birth outcomes and newborn anthropometry. Predictive modelling uses big data with multimodal variables such as genetic, psychological, demographic, socioeconomic and obstetric characteristics. Machine learning (ML) is a subset of artificial intelligence. Monitoring the performance of ML models involves evaluating accuracy, precision, recall and F1 score. The aim of this study was to examine the prediction for criteria term of delivery and body weight for gestational age (WGA) based on psychological, biomedical, demographic, socioeconomic variables and cigarette consumption. The sample consisted of 216 healthy pregnant women and their newborns, participants in the Croatian Islands' Birth Cohort Study (CRIBS) who had complete information from questionnaires and all biomedical documentation. The random forest classification model was created without and with the application of SMOTE (synthetic minority oversampling technique). A resampling strategy was used due to imbalanced number of subjects in delivery at term vs. delivery before term categories, as well as between newborns in AGA/yes vs. AGA/no categories. The random forest model applied for criteria term of delivery on real subjects showed a very accurate and specific prediction but less sensitive or imprecise due to a more biased classification of subjects in the majority category of delivery at term. Furthermore, the random forest model applied for the AGA criterion on real subjects showed a very accurate and sensitive prediction, but non-specific due to heterogeneous groups of subjects in both AGA/yes and AGA/no categories. Application of the random forest model using the SMOTE technique enabled better prediction with increased evaluation measures for both criteria. It is reasonable to conclude that increasing the amount of data and obtaining more information leads to efficient prediction.

Keywords: machine learning, random forest model, term of delivery, weight for gestational age, birth cohort, the CRIBS study



Presentation number: ISGA 09

ACCELERATION OF AXIAL ELONGATION AND ITS ASSOCIATION WITH PREPUBERTY OCULAR BIOMETRY

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PURPOSE: To determine the relationship between acceleration of the axial elongation and prepuberty ocular biometrics from 8.5 to 14.5 years old. **METHODS:** A prospective cohort study was performed in 67 right eyes of elementary school students for six years (8.5 to 14.5 years). All participants underwent optical axial length, anterior chamber depth and lens thickness measurement annually. The annual axial elongation was calculated in each year. Then, the acceleration of the axial elongation was quantified by the coefficient of the regression analysis. Spearman's correlation was used to investigate the correlation between ocular biometrics at 8.5 years old and the acceleration of the axial length. **RESULTS:** The mean axial length at the first year was 23.39 ± 0.92 mm. The mean axial elongation for 6 years was 1.52 ± 0.50 mm, and the mean acceleration of the axial elongation was -0.015 ± 0.048 . Acceleration of the axial elongation was significantly correlated with 8.5 years old axial length ($r = -0.44$, $p < 0.001$), anterior chamber depth ($r = -0.42$, $p < 0.001$), and lens thickness ($r = 0.33$, $p = 0.007$). **CONCLUSIONS:** Hyperopic ocular biometry at the age of 8.5 years may be the accelerating factor of axial elongation during early adolescence.

Keywords: Eye growth, axial elongation, myopia



Presentation number: ISGA 10

QSAR AND MACHINE LEARNING APPROACH TO ASSESS THE POTENTIAL BIOACTIVITY OF METABOLITES

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Metabolomics, the comprehensive study of small molecules in biological systems, has become a powerful tool for uncovering disease mechanisms and identifying potential biomarkers. Central to metabolomics research is the need to assess the bioactivity of metabolites, which can provide insights into their physiological effects. Quantitative Structure-Activity Relationships (QSAR) based on machine learning, offers a promising approach to predict the bioactivity of metabolites based on their chemical structures. QSAR is a computational technique that associates the chemical structures of molecules with their biological activities. It allows us to predict the biological activity of unobserved compounds based on their structural features, offering insights into their potential effects on biological systems. In this study, we applied machine learning-based QSAR to evaluate the potential bioactivity of endogenous metabolites. The models were trained on known bioactive compounds from the Tox21 dataset and validated to ensure robustness and accuracy. In the next step, a dataset of metabolomics profiles from the COPSAC2010 childhood cohort was used to predict metabolite bioactivity with the pretrained models which returned activities across 7 biological targets for each of the metabolites. Given the predictions, our findings reveal a significant association between predicted bioactivity and physiological outcomes, demonstrating the utility of QSAR and machine learning in metabolomics research. Moreover, the widespread use of these computational methods highlights how they can change metabolomics by allowing quick and thorough analysis of metabolite bioactivity.

Keywords: qsar, machine learning, metabolomics, biological targets, bioactivity



Presentation number: ISGA 11

STATISTICAL METHODS TO IDENTIFY GROWTH FALTERING IN CHILDREN

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The first 1000 days of life are thought to be essential to a child's development, both physically and mentally. Children who suffer from growth faltering can also be at higher risk of disease, impaired development and death. Therefore, it is crucial to be able to distinguish when a child is growing well and when their growth may be faltering. Currently there are many definitions which are used to diagnose a child's growth as faltering. These can vary depending on the country the child is in, and the growth charts used. However, due to arbitrary choices and varying thresholds, current definitions of child growth faltering can have some limitations. Recently with increased computational power there has been the opportunity to develop statistically novel methods for estimating growth patterns. One such method is to take a functional approach to the data where measurements of the child's weight are considered to be observations from an unobservable underlying smooth process. Viewing the data as a continuous curve both overcomes issues which can arise with the irregularity of data collection and reduces the dimensionality, hence having the potential to increase computational efficiency. This work will present a comparison of the effectiveness of both existing and emerging methods in identifying a variety of patterns of child growth faltering. An extensive simulation study will be used to quantify the performance of each method.

Keywords: growth, faltering, functional data analysis, statistics, data science, data analytics



Presentation number: ISGA 12

EPIGENETIC CHANGES IN NR3C1 GENE

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Epigenetics is the study of changes in gene function that are mitotically and/or meiotically heritable and that do not entail a change in DNA sequence. On such level of regulation is methylation, which decreases with age, meaning a newborn has higher DNA methylation compared to the older population. Epigenetic markers are heritable yet adaptable, changes can happen throughout life, from early prenatal development through adulthood. Some epigenetic changes can be added or removed in response to changes in behaviour or environment and these changes can affect our health in different ways. During the sensitive period of prenatal development, a pregnant woman's environment and behaviour during pregnancy, such as her diet and other habits, can change the baby's epigenetic markers and affect the possibility of contracting various diseases in older age. The research was conducted using data collected during the implementation of the "Croatian Island's Birth Cohort Study (CRIBS)" project, aimed at elucidating factors related to metabolic syndrome (MetS), which increasingly affects a significant part of the population with a prevalence of more than 30% in the general population of Croatia, with a higher rate on Croatian islands, up to 58%. The specific characteristics of the eastern Adriatic islands allow for the development of patterns of risk factors that influence the occurrence of MetS. The aim of this research was to detect and compare epigenetic changes in terms of methylation of the NR3C1 gene in pregnant women and their newborns in relation to place of living: mainland vs islands. The underlying assumption is that differences in adaptation related with place of living may influence methylation levels.

Keywords: epigenetics, NR3C1, methylation, pregnancy



Presentation number: ISGA 13

SIZE AT BIRTH AND HEAD CIRCUMFERENCE- HEIGHT INDEX IN NEWBORNS WITH SKELETAL DYSPLASIAS FROM A REFERRAL PEDIATRIC HOSPITAL IN ARGENTINA

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Introduction: Skeletal dysplasias are rare diseases affecting bone and cartilage, with a prevalence of 3.2/10,000 newborns in South America.¹ Auxological evaluation of the newborn is important as an indicator of neonatal morbidity and mortality and it is a simple tool to suspect skeletal diseases. **Objectives:** To determine the prevalence of low Weight (W), Body Length (BL) and body disproportion (BD) at birth in patients with molecular diagnosis of achondroplasia (ACH), hypochondroplasia (HCH), hypophosphatemic rickets (HR), and SHOX (S). **Materials and Methods:** Retrospective and descriptive study of anthropometric data obtained from medical records between 2002 and 2023. Children with recorded W, BL, and Head Circumference (HC) with gestational age were included, and the z score was calculated according to INTERGROWTH-21st 2,3. 2,3 The HC/BL index z-score was calculated according to Argentine references.⁴ **Results:** Out of 581 patients, 453 were included: 62% diagnosed with ACH, 12% HCH, 18% HR, and 8% S. The mean gestational age was 38 weeks (SD 8.78). The mean BL was 46.20 cm (-1.06 DE) and 31%, 12%, 2%, and 8% were small for gestational age for ACH, HCH, HR and S, respectively. The mean W was 3.21 kg (SD 0.45) and 1.42%, 1.78%, 6.17%, and 8.33% had low W at birth for ACH, HCH, HR and S, respectively. The mean HC was 35.82 cm (SD 1.99). Macrocephaly (>2 SD) was present in 47.14%, 32.14%, 4.93%, and 5.55%, and relative macrocephaly (HC/BL > 2 SD) in 57.8%, 28.5%, 1.2% y 13.8% for ACH, HCH, HR and S respectively. No significant differences were found in birth size between offspring of affected (n=59) and unaffected mothers. **Conclusions:** Perinatal auxology is a useful, simple, accessible and low-cost tool for early suspicion of skeletal diseases. Seventy-eight percent of registered patients had complete perinatal anthropometric data. The deficiency in recording anthropometric data at birth represents a missed opportunity in pediatric care.

Keywords: Skeletal dysplasia, neonatal morbidity and mortality, Argentina



Presentation number: ISGA 14

DEVELOPMENT OF DISEASE-SPECIFIC GROWTH CHARTS FOR ARGENTINE PRADER WILLI SYNDROME WITHOUT HORMONE GROWTH TREATMENT

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In order to generate and report growth curves for height, sitting height, hands and feet for Argentine children with Prader Willi syndrome (PWS) without growth hormone treatment, 169 children (81 boys) aged 0–19 years attending in the main public pediatric hospital, Hospital Garrahan, were measured between 1992 and 2019. Methods: anthropometric measures (1174) were obtained according to standardized methods in patients with molecularly confirmed PWS. Growth curves were developed and the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles were estimated applying the LMS method for summarizing growth data which adjusts for skewness. The height data were plotted for comparison purposes with the normative 50th percentile using argentine reference and german PWS growth data*. Results: Growth curves for height, sitting height, hands, and feet were developed from 169 male and female infants with PWS aged 0 to 19 years. Mean adult height was 145.3 cm (N=88) and 153.2 cm (N= 81), which are 15.4 cm and 19.6 cm below the 50th percentile of the argentine general population, for girls and boys respectively. In comparison, with German PWS, the argentine PWS references differences were 3.3 cm and 5.9 cm below in girls and boys, respectively. Regarding mean sitting height, it was 9.03 cm and 9.61 cm shorter than Argentine references in girls and boys, respectively. Conclusion: There are differences in adult height between argentine and german PWS references. Countries specific local growth references for children with some genetic conditions such as Prader Willi Syndrome are valuable tools for detecting additional conditions affecting growth, for estimating final height and recording responses to growth hormone therapy, commonly used in infants and children with PWS. *Hauffa, B.P. et al (2000).

Keywords: Prader Willi Syndrome. Anthropometry. Height.



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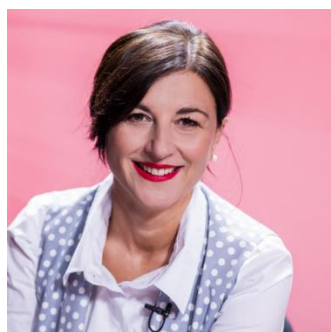
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ABOUT INVITED SPEAKERS





Special plenary lectures



Izv. prof. dr. sc. Sanja Musić Milanović

Izv.prof.dr.sc. Sanja Musić Milanović is a distinguished expert in the field of public health and epidemiology, renowned for her extensive work in promoting healthy lifestyle and preventive healthcare in Croatia. With a medical degree from the University of Zagreb and a Ph.D. in public health, Dr. Musić Milanović has dedicated her career to advancing public health initiatives and research. Her work at the Croatian Institute of Public Health includes overseeing national programs that focus on community

health education, policy development, and evidence-based interventions to improve public health outcomes. She is head of the Health Promotion Division which is the Reference Centre of the Ministry of Health for Health Promotion and leads the implementation of the National Programme "Healthy Living". She is also a respected academic, holding a position as an Associate Professor at the School of Medicine, University of Zagreb. Dr. Musić Milanović's commitment to public health extends beyond her professional responsibilities. She actively participates in various public health campaigns and collaborates with international organizations to enhance healthcare practices globally.



Prof. dr. sc. Dragan Primorac

Prof. dr. Dragan Primorac is a pediatrician, forensic scientist and subspecialist in medical genetics. He is among the top 2% of scientists with the greatest influence of citations. He is the first holder of the title "Global Penn State Ambassador" in the history of that University founded in 1855. Until recently, he was the president of the Committee on International Relations of the American Academy of Forensic Sciences. He is the president of the "International Society for Applied Biological Sciences", one of the most respectable international scientific organizations in the field of

clinical and forensic genetics, with eight Nobel Prize winners participating in its work. He is a full professor at Penn State University, the University of New Haven, the Chinese Xi'an Jiaotong University, College of Medicine and Forensics, and the medical faculties of the Universities of Split, Osijek and Rijeka. In total, he has published around 300 scientific papers, congress reports and about 30 books and book chapters, and has been cited more than 8,870 times (Google Scholar). Primorac is among the first scientists in the world to apply DNA analysis for the purpose of identifying skeletal remains from mass graves and is among the founders of forensic genetics in Croatia. In 1993, together with his team, he explained the molecular mechanism of a type of Osteogenesis Imperfecta. In 2000 he was the author of original results on the origin of Europeans, and among them Croats, which were published in the journal Science, and the author of a paper published in the journal Nature in which, from a genetic point of view, a great step forward was made in understanding one of the most significant migrations of anatomically modern humans, which took place 75,000 years ago from Africa. In Croatia, he introduced the integrated concept of personalized medicine into clinical practice. His special interest and great contribution is in the field of regenerative medicine and cell therapy, and in 2017, for the first time, with his team he explained the molecular basis and



therapeutic effect of mesenchymal stromal cells isolated from adipose tissue during the treatment of articular cartilage damage. In 2018, in cooperation with the company OneOme, which was founded by the famous American Mayo Clinic, the systematic introduction of pharmacogenomic testing into clinical practice was launched for the first time. In 2020, as the president of the Health Commission of the Croatian Football Association, together with his American colleagues, in accordance with the principles of personalized medicine, he introduced the analysis of 294 genes associated with the occurrence of sudden cardiac death in athletes with the aim of prevention. During the COVID-19 pandemic, he leads a team of scientists from the St. Catherine Specialty Hospital, Split Clinical Hospital Center and Slovenian "Educel", which was among the first in the world to successfully apply mesenchymal stromal cells for the purpose of treating a patient with COVID-19 with acute respiratory distress syndrome.



Prof. Davor Štimac, MD, PhD, Specialty Hospital Medico, Rijeka, Croatia, Department of Internal Medicine, Faculty of Medicine, University of Rijeka, Croatia

Davor Štimac is the director of the Specialty Hospital Medico in Rijeka and a full professor at the Department of Internal Medicine of the Faculty of Medicine, University of Rijeka, Croatia. He is an internal medicine specialist and his main areas of scientific and professional interest include gastroenterology, endoscopy, liver and pancreatic diseases, as well as treatment of obesity. Apart from his MD and PhD from the Faculty of Medicine in Rijeka, he holds a PhD in health management from the University of Zagreb and the London School of Economics. Through training at globally renowned clinics in Padova, Milano, Udine, Copenhagen, London and Cleveland he further perfected his skills in gastroenterology. Before coming to the Specialty Hospital Medico, he was the General manager at the University Hospital Centre Rijeka and the Head of the Department of Internal medicine, Faculty of Medicine. He is the most cited Croatian gastroenterologist, he mentored many master and PhD theses, authored over 30 textbooks and textbook chapters, organized and participated in a number of international conferences. Also, he led several national research projects, some of which include: Prognostic factors in acute pancreatitis; Effects of enteral nutrition in severe acute pancreatitis; Antimicrobial prophylaxis in the treatment of patients with acute pancreatitis; The relationship between the occurrence and severity of liver and pancreas damage in people suffering from alcohol addiction. Currently, he is the Vice president of Croatian Academy of Medical Sciences, the Vice president of Croatian Society for Quality Improvement in Health Care and the President of Croatian Society of Obesity. Throughout his career he received various awards and accolades (Medal of St. Vid, annual award of the City of Rijeka, award of the Croatian Medical Association for the best scientific publication in the field of clinical medicine).



EAA Plenary Speakers



Kate E Pickett, OBE FRSA FFPH FAcSS, Professor of Epidemiology, Academic Director of Health Equity North, Associate Director of the Leverhulme Centre for Anthropocene Biodiversity University of York, UK

Kate Pickett trained in biological anthropology at Cambridge, nutritional sciences at Cornell and epidemiology at UC-Berkeley. She is currently Professor of Epidemiology and Associate Director of the Leverhulme Centre for Anthropocene Biodiversity at the University of York and an Academic Co-Director of Health Equity North. She is a Fellow of both the RSA, the UK Faculty of Public Health and the Academy of Social Sciences. She was awarded an OBE in 2023 for services to societal equality. She is co-author, with Richard Wilkinson, of the worldwide best-selling *The Spirit Level* (2009) and *The Inner Level* (2018). *The Spirit Level* was awarded Publication of the Year by the Political Studies Association, chosen as one of the Top Ten Books of the Decade by the *New Statesman*, and one of the top 100 books of the century by the *Guardian*. She is a co-founder and patron of The Equality Trust and a trustee of the Wellbeing Economy Alliance.



Professor Jan C. Semenza, Environmental epidemiologist Department of Sustainable Health at Umeå University, Sweden Heidelberg Institute of Global Health, University of Heidelberg, Germany

Jan C. Semenza is an environmental epidemiologist with 30 years of experience in climate change and health. He led the US CDC response to the 1995 heat wave in Chicago that claimed the lives of more than 700 individuals. He elucidated the underlying medical, environmental, societal, and behavioral causes of heat-related mortality. These insights became the underpinning of policy interventions and heat health action plans in the US, designed to prevent these climate change impacts. Moreover, he pioneered the characterization of heat-related morbidity by analyzing excess hospital admissions. Over the course of 15 years, he led the work on infectious diseases and climate change at European Centre for Disease Prevention and Control (ECDC). He investigated climatic and environmental determinants of water- food- and vector-borne diseases and developed novel surveillance and early warning systems. For example, he devised a tool that has been operationalized at ECDC to monitor sea surface temperature and salinity in marine environments to assess and forecast the suitability of vibrio infections, a potentially fatal disease. He also used population mobility to predict the risk of importation of tropical diseases into Europe. As a lead author of the Intergovernmental Panel on Climate Change (IPCC) AR6 report, he wrote the infectious disease section. He has developed indicators for climate change and health that are tracked as part of the global Lancet Countdown reports and is the co-lead of WG1&2 of the Lancet



Countdown in Europe. Currently, he is associated with the Department of Sustainable Health at Umeå University in Sweden and Heidelberg Institute of Global Health, at the University of Heidelberg in Germany.



Professor Eörs Szathmáry, Biological Institute, Eötvös University, Budapest, Hungary Research Professor, Institute of Evolution, Centre for Ecological Research, Budapest, Hungary Director, Center for the Conceptual Foundations of Science, Parmenides Foundation, Pöcking, Germany

Eörs Szathmáry is Professor of Biology at the Department of Plant Taxonomy and Ecology of Eötvös Loránd University, Budapest, where he also directs the PhD programme in Evolutionary Genetics and Conservation Biology. He is the Director of the Parmenides Centre for the Conceptual Foundations of Science at the Parmenides Foundation.

Since 2011, Eörs Szathmáry has been a visiting professor at the Faculty of Biology, Ludwig Maximilian University in Munich. Since 2021 he is Research Professor at the Institute of Evolution, Centre for Ecological Research, Hungarian Academy of Sciences, Budapest. His main interests are in evolutionary biology and include the following topics: major evolutionary transitions, origin of life and the genetic code, origin of the cell, origin of animal societies, origin of human language, levels and mechanisms of biological cooperation, Darwinian neurodynamics and astrobiology. With his mentor, John Maynard Smith, he has published two landmark books which are the main references in the field (*The Major Transitions in Evolution*, Freeman, 1995, and *The Origins of Life*, Oxford University Press, 1999). Both books have been translated into other languages (so far into German, French, Japanese and Hungarian). His periods abroad include (in chronological order): University of Sussex (Brighton, UK), MRC National Institute for Medical Research (London, UK), Wissenschaftskolleg zu Berlin (Institute for Advanced Study), University of Zurich, Bellaggio Centre of the Rockefeller Foundation, College de France (Paris), Parmenides Foundation (Pullach/Munich). He is a member of the Presidium of the Hungarian Academy of Sciences, the Norwegian Academy of Sciences and Letters, the Academia Europaea and EMBO. Since 2021 he is Vice-President of the International Basic Sciences Programme (IBSP) of UNESCO. He has been awarded the New Europe Prize for Higher Education and Research (1996), the Academy Prize (1999) and the Széchenyi Prize (2017).



EAA Confirmed Invited Speakers



Mait Metspalu, Institute of Genomics, Tartu, Estonia

Mait Metspalu is the Director of the Institute of Genomics in Tartu, Estonia. His research concentrates on using and developing population genetics approaches to understand the genesis of the genetic diversity patterns of humans through reconstructions of past population movements, splits and admixtures as well as adaptations to local environments (both natural and manmade). During the few past years Mait has also started a dedicated ancient DNA program aiming mostly at reconstructing population changes in the East European Plain since the Paleolithic. Until 2018 he was the Director of the Estonian Biocentre, the leading research institute in Estonia in the interdisciplinary and interconnected fields of evolutionary genomics, population genetics and archaeogenetics. In 2018 they merged with Estonian Genome Center, which houses the population based Estonian Biobank containing genetic and health data for a cohort of 200 000. Mait became the Director of the Institute of Genomics, University of Tartu in 2018.



Emanuela Cristiani, Sapienza University of Rome, Rome, Italy

Emanuela Cristiani is Associate Professor of Prehistoric Archeology at the Department of Oral and Maxillo-Facial Sciences at Sapienza University of Rome, where she also directs the DANTE – Diet and Ancient Technology laboratory. Soon after she received her PhD in Archeology at Sapienza University of Rome in 2010, Cristiani was awarded a Wenner-Gren Foundation Post-Doctoral Fellowship. In 2011 she obtained a Marie Curie Individual Research Fellowship at the University of Cambridge (UK). Subsequently, in 2013, she was Associate Research Fellow at the Italian Academy for Advanced Studies in America (Columbia University, USA). Since 2015 E. Cristiani is principal investigator of the ERC Starting Grant "HIDDEN FOODS: Plant foods in Paleolithic and Mesolithic societies of SE Europe and Italy" aimed at exploring the diet and technology of ancient hunter-gatherers through the integration of various anthropological and cultural evidences. Her main research focus is the study of the identity and traditions of Paleolithic and Mesolithic societies of southern Europe through the characterization of their material culture.



Vladimir Ivković, Massachusetts General Hospital, Harvard Medical School and Harvard University, USA

Vladimir Ivković is a translational neuroscientist and integrative physiologist with emphases in neuroimaging, physiology, operational and behavioral assessments in extreme environments and clinical settings. He is the Director of the Laboratory for Neuroimaging and Integrative Physiology at the Massachusetts General Hospital, an Instructor in Psychiatry at the Harvard Medical School and an Instructor in Neuroscience at the Harvard University.

He conducted numerous studies on healthy, elite (astronauts, firefighters, active military, athletes), and patient (Parkinson's disease, cardiosurgical) populations in operational and clinical environments. He currently serves as a principal investigator on a translational study of neurophysiologic and cognitive markers of resiliency to post-traumatic stress disorder (PTSD), and a co-investigator on the first complex spaceflight study investigating functional brain, neurobehavioral, immune, metabolomic, and sleep changes in NASA's missions.



Christiane Scheffler, University of Potsdam, Germany

Christiane Scheffler is Human Biologist at University of Potsdam and interested in research on Human Growth and Development. She studied Biology, Chemistry and Pedagogics. Her main research interest is phenotypic plasticity on human growth in association to changing environmental and social living conditions. Her main scientific interest is the impact of changing environment on body measurements. Currently she is working on social regulation of body

height, especially due to secular trend in historic and recent in European and stunted populations. She has conducted a big data bank of anthropometric measurements of children and adults. She is founder and editor of the Journal "Human Biology and Public Health" and published more than 100 scientific paper and book chapter. She is board member of the European Anthropological Association and member of the Anthropological Society in Germany, the Auxological Society and the Society for the Studies of Human Biology. As an expert of anthropometrics she is a member of national (DIN) and international (CEN, ISO) standardization committees.



Mario Novak, Institute for Anthropological Research, Zagreb, Croatia

Mario Novak received BA in history and archeology from the University of Zagreb, where he also received his PhD in Roman period archaeology (bioarchaeology). Between 2002 and 2013, he worked at the Croatian Academy of Sciences and Arts, and from 2013 to 2015 at the University College Dublin as a post-

doctoral researcher. Today, he is working at the Institute for Anthropological Research in Zagreb as a senior research associate. His research is focused towards a holistic study of human skeletal remains from archaeological contexts. In his research, he combines numerous



analytical methods taken from various scientific disciplines such as (bio)archaeology, stable isotope analysis, paleogenetics, radiology, etc. He is the PI and collaborator on several domestic and international projects, and in addition to publications in scientific and professional journals, he has presented the results of his research at more than 80 professional meetings.



Janina Tutkuvienė, Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University, Lithuania

Janina Tutkuvienė is a doctor, anatomist and anthropologist, Head of the Department of Anatomy, Histology and Anthropology (Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University). She also heads Doctoral School of Medicine and Health Sciences at Vilnius University. Her research interests are interdisciplinary studies of the human body (growth and development, aging) in a changing environment, variations of body in health and disease, evolutionary medicine. She prepared growth guidelines and charts for Lithuanian children. Her current research interests include child growth and maturation, growth programming, physical status in relation to various clinical pathologies, body image and attractiveness, craniofacial research. Professor has published (together with co-authors) over 200 publications (including articles, chapters at the monographies, textbooks, also popular science publications). She has given numerous scientific presentations or keynote lectures at the Universities in various European countries and US. Janina Tutkuvienė supervised and consulted 12 doctoral dissertations, and currently supervises four PhD students. Janina Tutkuvienė has participated in several EC projects (STOP-II, AGIS, ISEC, Leonardo da Vinci, HORIZON 2020, Alliance4Life). She is an active member of many international scientific societies and is one of the editors of the journals *Anthropologischer Anzeiger* and *HOMO*, also editorial board member of *Annals of Human Biology* and *Collegium Antropologicum*. Professor has a broad collaboration with scientists from many countries (Austria, Croatia, Germany, Latvia, Poland, Switzerland, UK, US and the others).



Helen Liversidge, Institute of Dentistry, Faculty of Medicine and Dentistry, Queen Mary University of London, UK

Helen Liversidge qualified in dentistry from Stellenbosch, South Africa. She worked in NHS and private general dental practice whilst at the same time completing an MSc (Mineralised Tissue Biology) and PhD (Human Tooth development in an archaeological population of known age) at University College London studying with Professors Alan Boyde and Christopher Dean (respectively). She joined Child Oral Health in the Dental Institute, Barts and The London, Queen Mary's School of Medicine and Dentistry in 1985. Helen teaches undergraduate and postgraduate dental students in clinical paediatric dentistry and has supervised numerous postgraduate research projects, PhD's and joint supervision with Universities in Dunedin, New Zealand and Nairobi, Kenya. Her research area and most important publications relate to tooth formation and estimating age from developing teeth.



ISGA-SSHB Confirmed Invited Speakers



Ahmed Elhakeem, Bristol Medical School, University of Bristol, UK

Ahmed is an epidemiologist working on the EU funded LifeCycle and LongITools projects. His research uses large multicohort collaborations to study the determinants of cardio-metabolic and musculoskeletal health trajectories. His current research includes studies relating to medically assisted reproduction, pregnancy complications, pubertal growth, physical activity, and environmental exposures. He is

an epidemiologist working on the EU funded LongITools project. His research uses large multicohort studies to investigate the determinants (and consequences) of cardio-metabolic and musculoskeletal health trajectories across the life course. His current research includes various studies relating to assisted reproductive technology, pregnancy complications, pubertal growth, physical activity, and environmental exposures.



Babette Zemel, Children's Hospital of Philadelphia, University of Pennsylvania, Philadelphia, USA

Dr. Zemel is a biological anthropologist by training, and Professor of Pediatrics at The University of Pennsylvania Perelman School of Medicine in the Division of Gastroenterology, Hepatology and Nutrition. She directs the Nutrition and Growth Laboratory at The Children's Hospital of Philadelphia, which also serves as the Nutrition Core for the Center for Human Phenomic Science at her institution. The Nutrition and Growth Laboratory provides assessment of growth, body composition, energy expenditure, bone density and muscle strength and supports a broad, interdisciplinary group of investigators.

Her research program aims to improve understanding of lifelong health and how it relates to childhood antecedents of physical growth and maturation, body composition, population ancestry/genetics, and lifestyle factors. Such understanding has public health implications for disease prevention and lifelong wellness. It also addresses concerns for children across a wide spectrum of chronic diseases who experience impaired growth, altered body composition and limitations in nutrition and physical activity. She has primarily focused on two health concerns, bone fragility and obesity. I was the site PI for the multi-center, multi-ethnic, longitudinal, prospective study, the NICHD Bone Mineral Density in Childhood Study, and related studies investigating the genetics of bone accretion in childhood in this cohort. She has also conducted a study of bone accretion in very young children. These studies have provided reference ranges for bone density in children and advanced our understanding of bone mineral accretion from early childhood through adulthood, and effects of growth, muscle development, physical activity, diet and genetics during this critical life phase. The other broad theme in my research is childhood body composition and development of obesity. I lead the Infant Growth and Microbiome Study that is examining factors contributing to excess weight gain in African



American infants and young children, including the gut microbiome and metabolome and contextual factors associated with growth and dietary intake. She has also developed reference ranges for assessment of growth and nutritional status in children with Down syndrome, premature infants, and DXA based body composition for children and adolescents. Additional accomplishments include behavioral interventions to evaluate the effect of increased calcium intake in school age children and a behavioral intervention to reduce energy intake and increase physical activity in obese adolescents. She also collaborates extensively with pediatric experts in children with chronic diseases such as kidney diseases, sickle cell disease, childhood cancer survivors, and cardiovascular diseases.



Jelena Šarac, Institute for Anthropological Research, Zagreb, Croatia

Jelena Šarac, PhD, is an anthropologist, a senior research associate and the head of the Laboratory for Molecular Anthropology at the Centre for Applied Bioanthropology, Institute for Anthropological Research, Zagreb, Croatia. Her research interest involves anthropological investigation of maternal and child health, with special emphasis on the development of complex diseases, as well as evolutionary biology and population genetics. Her early work was focused on the anthropological analysis of genetic diversity and population structure in the eastern Adriatic and the wider area of Croatia and Europe based on molecular genetic markers (mitochondrial DNA and Y chromosomes) and the study of microevolutionary, historical and cultural processes that shaped the genetic landscape of these populations. In the last years her focus shifted towards the identification of risk factors for the development of complex non-communicable diseases (especially metabolic syndrome, diabetes mellitus and obesity) in early childhood, adolescence and adulthood and means of their prevention, through studies performed on Croatian islands. The investigation of maternal and child health in Dalmatia, Croatia and the identification of early risk factors affecting future well-being of the child have been in the center of her latest work, based on her active involvement in the "Croatian Islands' Birth Cohort Study (CRIBS)" funded by the Croatian Science Foundation. She is also involved in the Horizon Europe project on improving child health with regards to indoor air pollution ("Evidence-driven indoor air quality improvement - EDIAQI"). She is an author or co-author of more than 40 scientific publications with a h-index 13. From 2010 onwards she taught several Anthropology undergraduate and graduate courses at the Faculty of Humanities and Social Sciences and the Faculty of Science.



Katherine A. Kentistou, MRC Epidemiology Unit, University of Cambridge, UK

Dr. Katherine Kentistou is a genetic epidemiologist and works as a Research Associate at the University of Cambridge in the UK. Her research aims to identify and characterise genetic mechanisms that drive growth and body composition and their relation to metabolic disease susceptibility, using population-level data. She has established a framework that integrates genetic association information with other types of functional data, pertaining to gene expression regulation and protein function, to prioritise disease-relevant genes. Recently, she has brought together common genomic variant association data on pubertal onset and childhood growth from



several different population biobanks to apply this framework, alongside sequencing data on rare coding variants with large effects on these growth phenotypes. Katherine holds a BSc in Biology, an MSc in Human Molecular Genetics and obtained her PhD in Precision Medicine from the University of Edinburgh. She has authored and co-authored more than 40 scientific publications and has an i10-index of 17.



Lawrence Schell, Department of Anthropology, and Department of Epidemiology & Biostatistics, University at Albany, State University of New York, Albany, USA

Lawrence M. Schell is a Distinguished Professor in the Department of Epidemiology and Biostatistics Department and in the Department of Anthropology at the University at Albany, State University of New York, and a Clinical Associate Professor of Pediatrics at the Albany Medical College, Albany, NY. His research concerns the relationship of social factors to human prenatal and postnatal growth, and maturation particularly on the effects of pollutants disproportionately experienced by marginalized communities. He has conducted four major studies of pollutants and health. In 1992 he led a study of lead exposure and infant development among socioeconomically disadvantaged, mostly African American mothers and infants. In 1994 he began a research partnership with the Akwesasne Mohawk Nation living along the St. Lawrence River which was facing exposure to polychlorinated biphenyl pollution. Over the next twenty years his team conducted three studies with the Nation. Results from these studies pertain to the relationship of several pollutants to adolescent size (overweight and obesity), sexual maturation, thyroid function, and cognitive-behavioral status of 10–20-year-olds, as well as immune function and women's reproductive health. The 25-year collaboration with the Mohawk is cited as a model of collaborative and respectful research between scientists and Native Americans. Beginning with the study of poor women in Albany, it was clear that exposure to pollutants in the US affects communities of color disproportionately and their health suffers. In 2005 he established the Center for the Elimination of Minority Health Disparities at the University at Albany, funded continuously by NIMHD and served as its director until 2021. From 2016- 2021 he executed a program of transdisciplinary training in minority health disparities research funded with a 10-million-dollar S21 award from NIH supplemented by a 1-million-dollar award from the Hearst Foundations. He continues as a professor and a consultant on the Croatian Island Birth Cohort Study and with the Bergen Growth Studies group. He has edited nine books, conference proceedings and special issues of journals, and published over 130 articles and chapters on growth, maturation, and health disparities. He has organized 21 conferences and symposia.



Liina Mansukoski, Hull York Medical School, University of York, ActEarly Research, Bradford Institute for Health Research, UK

Liina is presently working on ActEarly, a large UKPRP funded research project focusing on early life changes to improve the health and opportunities for children living in areas with high levels of child poverty, Bradford, West Yorkshire and Tower Hamlets, London. This work is in collaboration with the Bradford Institute for Health Research at Bradford Royal Infirmary. Liina is leading the meta-evaluation of the program, developing core outcomes sets for ActEarly, and using quantitative methods to understand overall system change as a result of the ActEarly interventions. She further contributes to Teaching and Learning on the MBBS Programme and supervises Masters students. Before starting at the Hull York Medical School, Liina worked as a Research Fellow in the Department of Health Sciences at University of York. Previously, she has worked as a Child Growth and Development Research Fellow at the Hospital for Sick Children, and as a doctoral researcher and University Teacher at Loughborough University. She obtained her PhD in Public Health Nutrition from Loughborough University in 2019, and her BSc and MSc(Res) in Anthropology from Durham University. Liina's background is in the anthropology and human biology of growth, and her expertise are in: Child growth and development (e.g., inequalities, secular trends, nutritional status), Evaluation of early years public health interventions from a systems perspective (e.g., development of core outcome sets, consensus methods), Harnessing large longitudinal and routine datasets to address research questions related to growth and growth metrics (e.g., growth modelling using specialist software). In her current role Liina has further started investigating ways to utilise connected routine datasets in systems evaluation. Liina is a peer-reviewer for several human biology, anthropology and nutrition journals.



Linda Adair, Department of Nutrition and Fellow, Carolina Population Center, University of North Carolina at Chapel Hill, Chapel Hill, USA

Linda Adair is a Professor in the Department of Nutrition at the Gillings School of Global Public Health and School of Medicine at the University of North Carolina at Chapel Hill, Fellow at the Carolina Population Center, and Honorary Professor at the University of the Witwatersrand in Johannesburg. She earned her PhD in Biological Anthropology at the University of Pennsylvania and completed a Mellon Postdoctoral Fellowship for Studies at the Interface of Biology and Demography at the Carolina Population Center at the University of North Carolina at Chapel Hill (UNC-CH). Her research focuses on maternal and child nutrition, in particular, the determinants and consequences of infant and early childhood feeding and growth patterns, and the developmental origins of adult health. She has led the Cebu (Philippines) Longitudinal Health and Nutrition Survey for more than 30 years, and has been a collaborator on research in China, South Africa, Rwanda, and Malawi. As one of the founding members of the COHORTS collaboration, she has published numerous studies based on birth cohorts in low and middle-income countries. Her US work is with the Coordinating Center for the Environmental Influences on Child health (ECHO) which focuses on child obesity, airways, neurodevelopment and positive health. Her methodological focus is on the design and implementation of population-based health/demographic/nutrition surveys



and the application of longitudinal epidemiologic and structural models to health outcome research. At the University of North Carolina, she teaches courses in international nutrition as well and analytic methods in nutrition epidemiology. Adair is the 2014 recipient of the Kellogg International Nutrition Award, and was recently inducted into the American Society for Nutrition Society of Fellows. She has more than 300 peer-reviewed publications in biomedical journals.



Nicola L. Hawley, Department of Chronic Disease Epidemiology, Yale School of Public Health, New Haven, USA

Dr. Nicola Hawley is an Associate Professor of Epidemiology (Chronic Disease) and Anthropology at the Yale School of Public Health. Her expertise is in the etiology and prevention of obesity-related chronic disease in resource-poor, low-income settings. Her research focuses predominantly on Pacific Islander populations, although she has ongoing collaborations in South Africa, Uganda, Honduras, China, Columbia and the US. Methodologically, Dr. Hawley employs a life-course approach that utilizes cross-sectional, cohort, and randomized controlled trial designs to address questions of causality and identify critical periods of susceptibility. She is a mixed-methods expert and an advocate for community-engaged approaches to research, intervention, and development of health policy. Dr. Hawley's current research focuses broadly on: (1) understanding how maternal and child health are impacted by rising levels of obesity and diabetes in resource-poor settings; (2) determining how innovations in healthcare delivery can impact identification and treatment of obesity-related disease during the perinatal period; and (3) developing interventions focused on pregnancy, childhood, and adolescence to prevent the intergenerational transmission of obesity-related disease.



Outi Mäkitie, University of Helsinki and Helsinki University Hospital, Helsinki, Finland, Dept of Molecular Medicine and Surgery, Karolinska Institutet, Stockholm, Sweden

Outi Mäkitie received her MD degree at University of Helsinki in 1986 and completed specialty training in Helsinki for paediatrics in 1998 and for paediatric endocrinology in 2000. Presently she is Professor of Paediatric Endocrinology and Chief Physician at Children's Hospital, University of Helsinki, Finland, and Senior Researcher and Team leader at Karolinska Institutet, Stockholm, Sweden. Prof. Mäkitie's research has since the beginning of the research career focused on clinical and translational aspects of pediatric bone diseases, mainly on rare genetic disorders including skeletal dysplasia, childhood-onset osteoporosis and various defects of mineral homeostasis. Her research groups in Helsinki and Stockholm have identified new disease genes and elucidated the biological disease mechanisms in several pediatric bone disorders.



Patrick Mahoney, The Histology Lab | Skeletal Biology Research Centre, School of Anthropology and Conservation, University of Kent, UK

Patrick Mahoney is a human skeletal biologist who specialises in reconstructing the cell mechanisms underlying the morphology of hard tissues, especially deciduous teeth and long bones. This allows Patrick to address questions related to growth and development, bioarchaeology and human evolution. Dr Mahoney was awarded a first class BSc degree in Archaeology from University College London in 1999, and a distinction for an MSc in Human Osteology and Palaeopathology from the University of Sheffield in 2000. With Research Council funding, he gained a PhD from the University of Sheffield in 2004. Before joining the School of Anthropology and Conservation at Kent in 2008 as a Lecturer in Biological Anthropology, Patrick was employed as a postdoctoral researcher on AHRC and NSF-funded projects researching dental development in humans and fossil primates. Dr Mahoney's current research interests include: biorhythms and human growth, histology of hominoid deciduous teeth and evolution of human bone microstructure.ž



Paula van Dommelen, The Netherlands Organization for Applied Scientific Research (TNO), Leiden, The Netherlands

Dr. van Dommelen is a scientist at The Netherlands Organization for Applied Scientific Research (TNO). Her main focus has been on the development of technological innovations and data science to protect and improve child health worldwide. This includes the development of innovative statistical methods (including artificial intelligence, prediction modelling, matching techniques, etc.), personalized child health care applications, frameworks for decision support systems, youth health care guidelines and implementation strategies, and research on mental and physical child health, including many aspects of child growth and assessment of child development, such as growth chart construction, growth curve analysis, factors relating early growth and development to later outcomes, and the early detection of disorders related to growth and development. She developed and implemented a guideline for preventive child healthcare professionals in order to improve early detection of pathological disorders associated with short stature (or growth faltering) or tall stature (or accelerated growth). She developed digital health solutions for the management of growth disorders in pediatric patients receiving growth hormone therapy. She has a broad experience in analyzing data from multiple sources, such as survey questions, electronic health records of Youth Health Care, monitoring health systems for screening, the Dutch Perinatal and Neonatal registers, the Dutch Central Bureau of Statistics, the Netherlands Twin Register, worldwide eHealth tools for patients with growth disorders, and underlying data sets from the Bill and Melinda Gates Foundation. She has published over 100 peer reviewed scientific publications with a total H-index of 38.



Pétur Benedikt Júlíusson, National Institute of Public Health; Department of Clinical Science, University of Bergen; Children and Youth Clinic, Haukeland University Hospital, Bergen, Norway

Professor Pétur B. Júlíusson divides his time between the Norwegian Institute of Public Health (NIPH, leader of the Department of Health Registry Research and Development), Haukeland University Hospital (HUH, senior consultant, paediatric endocrinology) and the University of Bergen (UiB, professor). His main research interest is on childhood growth, pubertal development and obesity. At the NIPH he is administrating and facilitating research and developmental activities attached to major national registries (Medical Birth Registry of Norway, Cause of Death Registry, Heart Registry and Abortion Registry), as well as being involved in projects on health and development of children (PI of the HealthProfile 0-20 project, in the scientific advisory boards of the Mother, Father and Child Study (MoBa) and The Child Growth Study/WHO-COSI). At the HUH, he has been responsible for the development of the Obesity Outpatient Clinic treating children and adolescents, since start in 2012, and is the PI of the FABO-study, and effectiveness study employing Family- based Behavioural Social Facilitation Treatment, treating children and adolescents with severe obesity. Further, he is a co-PI of the eBATTLE Obesity study, a national multi-center study on treatment of adolescents with severe obesity. He is the PI of the Bergen Growth Studies 1 and 2 (BGS1 and BGS2); BGS1 provided the national growth charts currently used in Norway; BGS2 being the first (and currently the only) pubertal reference study conducted in Norway, using ultrasound as a novel method for objective assessment of breast tissue and testicular development. He is the current leader of Health Registry Group, Alek Health Cluster, Bergen. He has supervised 12 PhD candidates and has published 120 papers with peer review (November 2022).



Tim Cole, Great Ormond Street Institute of Child Health at University College London, London, UK

Tim Cole is Professor of Medical Statistics at the Great Ormond Street Institute of Child Health at University College London, where he has been since 1998. Previously he studied at the Universities of Cambridge and Oxford, and from 1970 to 2019 he was employed by the British Medical Research Council at, in turn, the Pneumoconiosis Research Unit in South Wales (1970-75), the Dunn Nutrition Unit in Cambridge (1975-98) and University College London. His research interests cover the statistics of anthropometry and growth and the factors affecting them across the life course. He has invented several novel growth charts, including the International Obesity TaskForce child obesity BMI cut-offs, and his LMS method is the statistical basis for constructing national growth references in the UK, the USA, WHO and elsewhere. More recently he developed the SITAR growth curve model for analysing longitudinal growth, which has particular applications in infancy and puberty where it estimates the timing and intensity of the growth spurt in individuals, i.e. peak velocity and age at peak velocity. He has produced open source software and patented the Cole Calculator to simplify growth assessment. Another of his interests is the use of dental and skeletal age imaging for assessing age in unaccompanied asylum-seeking children. In 2011



he acted as expert witness in several cases of Indonesian fishermen accused by the Australian Government of people smuggling. In 2022 he served as a member of the Home Office Age Estimation Scientific Advisory Committee to advise the UK Government on the use of biological measures of developmental age to improve age assessment. He has also contributed statistical insight to human nutrition research working with colleagues in the areas of infant feeding, child body composition, child bone health, energy intake and energy expenditure, all of which require an understanding of and adjustment for body size effects. He has a longstanding interest in statistical peer review, working as Statistical Editor with the BMJ for over 30 years, and leading a panel of statistical reviewers for the Archives of Disease in Childhood for 20 years. Tim Cole has published over 600 peer-reviewed research papers, of which 15 have more than 1000 citations, and 200+ have more than 100, on Google Scholar, with a total of more than 110,000 citations and an h-index of 152. In 2007 he was elected a Fellow of the Academy of Medical Sciences (FMedSci) and appointed an Honorary Fellow of the Royal College of Paediatrics and Child Health, and in 2022 he was elected a Member of the Academia Europaea (MAE). In 2015 he won the Royal Statistical Society's Bradford Hill Medal, in 2016 the Rank Prize for Nutrition, and in 2019 the Tanner Memorial Medal of the Society for the Study of Human Biology.



Will Johnson, Epidemiology and Population Health, School of Sport, Exercise and Health Science, Loughborough University, Loughborough, UK

Will Johnson is a Reader in Epidemiology and Population Health at Loughborough University in the UK. His research focuses on working with complex longitudinal data to investigate the life course epidemiology of non-communicable diseases in both high-income settings (e.g., UK and USA) and low- and middle-income settings (e.g., The Gambia and India). His experience and expertise are in investigating the role of body size trajectories and inequalities in obesity and related-disease development. Much of this work has been conducted across multiple cohorts of individuals born at different points in time, thereby allowing investigation of secular trends in longitudinal processes and relationships. From conducting this research, he has developed skills in the design and application of statistical methods to model longitudinal data, particularly those pertaining to human physical growth and obesity development. His research has resulted in over 85 publications (h-index 26; i10 index 56) and has been funded by (among others) the UK Medical Research Council, USA National Institutes of Health, the British Academy, and the Child Growth Foundation.

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