

Childhood body mass index and height and risks of polycystic ovary syndrome

Julie Aarestrup Bispebjerg and Frederiksberg Hospital, Denmark
Dorthe C Pedersen Bispebjerg and Frederiksberg Hospital, Denmark
Peter E Thomas Bispebjerg and Frederiksberg Hospital, Denmark
Jennifer L Baker Bispebjerg and Frederiksberg Hospital, Denmark

Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder among women of reproductive age affecting 5-20% of women worldwide. It is multifactorial in aetiology and associated with adverse reproductive and metabolic complications. Adult body size is potentially linked with PCOS risk. However, as PCOS already appears in the teenage years, we prospectively investigated if childhood body mass index (BMI [kg/m²]) and height are associated with subsequent risks of PCOS.

Methods

A cohort of 171,213 girls from the Copenhagen School Health Records Register, born 1930-1996 with measured weights and heights at ages 7-13 years were included. Women were prospectively followed in the Danish National Patient Register for PCOS diagnoses from ages 15-50 years. Cox regressions were performed to estimate hazard ratios (HRs) and 95% confidence intervals (CIs).

Results

During a 40-year period of follow-up, 630 women were diagnosed with PCOS (age range: 15.2-49.8 years). Girls with a BMI above average (z-score > 0) had a significantly increased risk of PCOS, whereas BMIs below average (z-score ≤ 0) were not associated with PCOS risks. At age 7 years, the HR was 1.73 (95% CI: 1.57-1.90) per BMI z-score among girls with above-average BMI. The associations were positive and significant at all childhood ages. Childhood height was linearly and positively associated with risks of PCOS at all childhood ages. At age 7 years, the HR was 1.19 (95% CI: 1.09-1.29) per height z-score.

Conclusion

Girls who are heavier than average or tall at school ages have increased risks of PCOS. These findings suggest that childhood body size at ages before PCOS typically emerges indicates a risk for the development of this disease.

Design, methods and baseline results in young soccer players: The INEX project

Maryam Abarghoueinejad	University of Porto, Portugal
Adam Baxter-Jones	University of Saskatchewan, Canada
Daniel Barreira	University of Porto, Portugal
José Maia	University of Porto, Portugal

Introduction

Performance in young soccer players is multidimensional. Physiological development, technical, and tactical skills, training experience all play important roles in game performance. A longitudinal design and appropriate analytical approach will provide valuable insights into the roles of growth, maturation and the environments on soccer performance. This study aims to present the design and methodology of the INEX project in a young soccer player's cohort.

Methods

Players were recruited from the In search of excellence in sport – a mixed-longitudinal study in young athletes (INEX), from 6 clubs of the Oporto Soccer Association. At baseline, a sample of 200 players was divided into four age-cohorts (11, 12, 13, and 14 yrs) with 50 players in each and followed annually for four years. Variables cluster around 5 domains (1) biological (anthropometry, body composition, maturation), (2) performance (physical and technical), (3) game knowledge (tactical skills), (4) training history and (5) clubs' infrastructures, equipment, human resources and development. The intention is to have ~800 observations across the entire sample across the 4 years, and an overall mass of data of ~40.000 data points. Ecological systems linked to multilevel models will be the joint templates for this project.

Results

Baseline results from all domains of the different cohorts will be presented.

Conclusion

This study will provide relevant information to coaches and clubs when conceiving solid and coherent developmental trajectories of young players' careers. Further, parents will also profit from the study when preparing themselves to support their sons' interests in training and competition.

Analysis of Alu elements within the human Major Histocompatibility class I region in the Comoros Archipelago

Said Nassor Abeid Université Chouaïb Doukkali, Morocco
Motrane Majida Université Chouaïb Doukkali, Morocco
Farhane Hamid Université Chouaïb Doukkali, Morocco
Harich Nourdin Université Chouaïb Doukkali, Morocco

Introduction

Alu elements are attractive markers for population genetics, diseases, forensics and paternity analysis due to their particular characteristics. Five polymorphic Alu insertions within the MHC class I region have been little examined in human populations. In our study, we aimed to analyze the genetic diversity of autochthonous Comorians from the three major islands of the archipelago using polymorphic Alu insertions within the MHC class I and to assess their relationships together and with other populations.

Methods

257 unrelated participants from Comoros archipelago: Grande Comore (86), Anjouan (93) and Moheli (78), were examined for five MHC Alu insertions. The data were analyzed for intra and inter- population genetic variation.

Results

All MHC Alu were polymorphic in the three samples and only one significant differentiation was observed between Anjouan and Moheli. According to the MDS and AMOVA results, the populations included in the inter-population analyses were grouped in three major clusters according to their genetic ancestry. The Comorians showed high haplotype diversity than other already studied African populations and occupied an intermediate position between African and Asian clusters.

Conclusion

MHC Alu insertions are useful markers to study micro-geographical genetic variations and interesting results about biological history and evolution of the Comoros have been obtained.

Body size and growth in childhood and the risks of disease in adult life

Jennifer L Baker Bispebjerg and Frederiksberg Hospital, Denmark

Introduction

With the continuing epidemic of obesity in childhood, gaining a better understanding of how body size and growth at these young ages, alone and in combination with later adult size, relate to non-communicable diseases is of great relevance for protecting the future health of children.

Methods

More than 50 studies investigating how childhood body size and growth relate to the later risks of disease based on data from the Copenhagen School Health Records Register (CSHRR) will be summarised. The CSHRR is a population-based cohort of 460,350 children born from 1930-1996 who had their heights and weights measured at school health exams. Outcomes were ascertained by linkages of personal identification numbers to national health registers. Adult body size came from linkages with studies, databases and national registers.

Results

Body mass index (BMI; kg/m²) at ages 7-13 years is positively associated with many diseases including cardiovascular disease, multiple sclerosis and type 2 diabetes. Childhood height is inversely associated with cardiovascular disease and type 2 diabetes. Childhood BMI, height and birth weight show a diverse pattern of associations with 15 forms of cancer. In studies on men, increasing in BMI from child to adult ages increased risks of type 2 diabetes and colon cancer.

Conclusion

Body size early in life and growth has a diverse pattern of associations with adult disease. These associations likely operate through many pathways, including tracking of body size. As body size in childhood can indicate later risks of disease, these studies highlight that this period of life may offer possibilities for intervention as to reduce the later burden of disease.

Relationship between trajectories of trunk fat mass development in adolescence through emerging adulthood and cardiometabolic risk at 36 years of age

Adam DG Baxter-Jones University of Saskatchewan, Canada
Erin Barbour-Tuck University of Saskatchewan, Canada

Introduction

The Saskatchewan Pediatric Bone Mineral Accrual Study (PBMAS) was initiated in 1991, when 248 boys and girls, aged 8-15 years, were recruited. Using serial measures (1991-1997, 2002-2007, 2009-2011 and 2016-2017) the study aimed to identify the development of body composition and its relationship to risk of adult disease. Previously, a relationship between adolescent trunk fat mass (TFM) and cardiometabolic risk at 26 years was identified. The present study examines developmental trajectories of TFM, during both adolescence and emerging adulthood (EA), of individuals categorized as either low or high metabolic risk (MRS) at 36 years of age.

Methods

Fifty-five individuals were assessed from adolescence (11.5 ± 1.8 years), through EA (26.2 ± 2.2) into young adulthood (35.6 ± 2.2 years) (median of 11 visits) for anthropometrics, blood pressure, blood metabolites, DXA, diet and physical activity. MRS groups were created using sex-specific median splits of continuous standardized risk scores (blood pressure and serum markers) at 36 years of age. TFM trajectories were analyzed using multilevel random effects models.

Results

The high MRS group had significantly steeper trajectories of TFM development in both adolescence and EA, 0.65 ± 0.11 and 0.44 ± 0.11 log g ($p < 0.05$) to TFM accrual, however physical activity was (-0.04 ± 0.02 ; $p < 0.05$).

Conclusion

Young adults with high cardiometabolic risk at 36 years of age had greater trunk fat mass accrual during both adolescence and emerging adulthood. These results support the need for intervention at both these critical periods of fat accrual.

The tooth, the whole tooth and nothing but the tooth- cohort and longitudinal study

Julia Beaumont University of Bradford, UK

Introduction

Measuring The isotope ratios of carbon and nitrogen from bone collagen, hair and nails have been a well-established method for investigating diet and physiological status in modern and ancient populations. Novel methods of analysis have allowed researchers to investigate childhood diet and physiology by applying this method to incremental sections of dentine. These have revealed short-term changes in diet, evidence for famine, breastfeeding and weaning behaviour, and the potential to identify in-uterine stress in Archaeological populations. Here we present initial results from modern deciduous teeth coupled with dietary and health data.

Methods

Teeth have been donated by children undergoing dental extractions in Bradford along with health and dietary information, which have then been demineralised, sectioned and isotope ratios measured using mass spectrometry at the University of Bradford. They are compared to 2 other modern populations and archaeological data.

Results

This is the first study to reveal the patterns associated with the shift in dietary markers from in-utero through breastfeeding and weaning in a modern British population. As such it has the benefits of both a cohort and longitudinal study of the changes in diet and physiology in this critical period of life.

Conclusion

The patterns seen in this extant tissue from the first 1000 days of life may help to identify infants who have experienced in-utero stress previously invisible to health professionals. This window on the womb could be critical in our approach to the long-term effects on an individual life course.

Age Period Cohort analysis: The identification problem and what to do (and not do) about it

Andrew Bell University of Sheffield, UK

There has been interest in finding separate effects of age, year and birth cohort for decades, in both the biological and social sciences. However, the exact collinearity between these three ($\text{Age} = \text{Year} - \text{Birth Year}$) lead to difficulty in estimating these effects. Because of this, it is impossible to estimate near-linear effects (or linear components of these effects) without making strong assumptions about at least one of these. This is a problem for anyone interested in any of age, period and/or cohort patterns in a particular outcome.

There have been many attempts to 'solve' this identification problem without having to make strong assumptions – however in each case, it turns out such models are, in fact, making hidden assumptions that were not intended by the user, as I show with simulations. I then consider what researchers should do, drawing on literature from across the social, biological and health sciences. This includes consideration of non-linearities around linear APC effects (with both statistical and graphical techniques), strong and explicit assumptions based on theory (for example assuming there are no linear period effects), including constraints on certain parameters to estimate ranges within which other parameters must fall. I provide an example focusing on mortality in the twentieth century. In each case, these methods acknowledge that there is a 'line of solutions' of possible combinations of APC effects, and not a single answer that can be estimated empirically. None of these methods represent a solution to the identification problem – rather they are an honest acknowledgement of the problem, with an awareness that the methods are limited by their assumptions.

Does complementary feeding with animal source foods (6-23 months) mediate the effect of predominant breastfeeding (0-5 months) on length at 24 months?

Komal Bhatia	University College London, UK
Tim Cole	UCL Institute of Child Health, UK
Sushmita Das	SNEHA, India
Neena Shah More	SNEHA, India
David Osrin	University College London, UK
Jonathan Wells	University College London, UK
Bianca De Stavola	University College London, UK

Introduction

Quantifying relationships between time-appropriate components of the infant and young child feeding continuum and growth in early childhood presents an analytic challenge. We draw on counterfactual thinking to address this issue.

Methods

We used data from an epidemiologic birth cohort study in urban informal settlements (slums) in Mumbai, India to decompose the effect of feeding practices on length at 24 months into the direct effect of predominant breastfeeding (PBF) at 0-5 months and its indirect effect through consumption of animal source food (ASF) at 6-23 months. We estimated predicted length at 24 months from the SuperImposition by Translation and Rotation model fitted to longitudinal length measurements. We used the parametric g-computational formula to conduct causal mediation analysis with time-varying mediators and baseline-induced confounding by diarrhoea in late infancy (n=438).

Results

We found a negative total casual effect of PBF on length at 24 months (-1.1cm; 95%CI: -1.75, -0.46; p=0.001). This was partially (30%) mediated by the effect of ASF consumption between 6 and 23 months (-0.33 cm; 95%CI -0.55, -0.12; p= 0.003), with most of the effect (-0.77 cm, 95%CI -1.41, -0.13; p=0.018) being attributable to pathways from PBF to linear growth that did not involve ASF.

Conclusion

The negative effect of PBF on length was largely direct. Early success in adhering to recommended infant feeding practices does not form a protective chain of practices stretching into the second year of life in a deprived urban setting. We demonstrate the application of the counterfactual approach to study child nutrition, and recommend further integration of life course epidemiology and growth research.

Inequalities in childhood IQ trajectories in Guatemala according to birth year, school, and height

Liina Mansukoski	Loughborough University, UK
Barry Bogin	Loughborough University, UK
J Andres Galvez-Sobral	Universidad del Valle de Guatemala, Guatemala
Luis Fúrlan	Universidad del Valle de Guatemala, Guatemala
William Johnson	Loughborough University, UK

Introduction

Lower childhood cognitive ability, commonly measured by the Intelligence Quotient (IQ), is associated with worse later life social, economic, and health outcomes. This study aimed to assess inequalities in childhood IQ trajectories in a large sample of Guatemalan school children, according to birth year, school, and height-for-age Z-scores (HAZ).

Methods

A multilevel model was developed to describe 57 244 IQ observations (level 1) in 22 646 children (level 2), aged 6-15 years born between 1955 and 1993, in five schools (level 3) from Guatemala City, Guatemala. Briefly, IQ trajectories were modelled as a quadratic polynomial age function (with random effects at level 2 & 3), birth year was added as a linear term and interacted with age, and HAZ was included as a two-term linear spline (with a random effect at level 3 for the first term).

Results

IQ trajectories differed across schools across ages, the inequality in average IQ at age 11 between the students of a high fee private institution and a no-fee public school was 28.5 points. Later born individuals had higher IQ compared to earlier born individuals ($B=0.16$, 95% CI 0.15 – 0.18), although this inequality narrowed in adolescence. A higher HAZ score was associated with higher IQ only in individuals with HAZ scores below 0 (1.4, 0.8 – 2.05), this effect was stronger in public compared to private school students.

Conclusion

We found large inequalities in the IQ of Guatemalan children. Lower HAZ was associated with lower IQ more strongly in children who attended disadvantaged schools, possibly reflecting the damaging effects of poor early life environments both for linear growth and cognitive development.

The growth and development of cohort studies

Noel Cameron Loughborough University, UK

Cohort studies are special forms of longitudinal studies that have long been accepted as the primary designs to acquire information on the process of human growth and development. Whilst a number of longitudinal studies of individuals and small groups of children, usually attending educational or military institutions, were conducted in the 18th and 19th centuries in Europe, it was not until the first half of the 20th century that longitudinal study designs of child development became common in the USA. The UK, by contrast, was a late developer in this regard and could not boast of the organisation of a longitudinal growth study of British children until James Tanner's initiation of the Harpenden Growth Study in 1949. Tanner was prompted to undertake a such a study design after visiting the American longitudinal studies in 1947 and appreciating their power to model the process of human growth and its variation within and between the sexes.

The further development of longitudinal studies in Europe owed a great deal to the emergence of 'social paediatrics', a post-WWII movement that recognised the importance of the child's environment to their growth, development, health and wellbeing. Longitudinal study research groups, primarily from Europe and the USA, met biennially in the 1960s and 1970s, at the Centre Internationale de l'Enfance in Paris, to discuss their studies and to compare and contrast their logistical methods, analysis procedures, and results. In those days of limited access to computing power, the exchange of experiences and information disseminated at those meetings was fundamental to the development and design of subsequent longitudinal and cohort studies that are being discussed at this meeting.

Prospective Cohort Study of Childhood Growth and Development among the Ju'Hoansi of Nyae Nyae, Namibia

Benjamin Campbell University of Wisconsin, USA

Introduction

Adrenarche has been an enigmatic part of human growth and development. Despite its association with middle childhood, the functional significance of increasing levels of DHEA is largely uncharted. Findings from the NIH normal brain development study provide strong evidence for an impact of DHEA on the brain including both cortical maturation and functional connectivity of the amygdala to the prefrontal cortex. Yet, the impact of undernutrition on adrenarche and its implications for cognitive development remain unexplored. We hypothesize that undernutrition, specifically low protein intake, before the age of 6 will lead to lower levels of IGF-1, with reduced development of the adrenal zona reticularis and lower DHEA levels. We expect to see lower DHEA levels associated with changes in cognitive function after the age of 6.

Methods

We propose to follow 300 (150 female) Ju'Hoansi children from villages in the Nyae Nyae Conservancy, Namibia starting at age 3. Yearly data collection will include standard anthropometrics. Protein intake will be determined using food frequency questionnaires. DHEA, DHEA-S and cortisol will be assayed in saliva and IGF-1 using dried blood spots. Cognitive development will be assessed using the dimensional change card sort (DCCS) and Raven's progressive matrix. Regression analysis will be used to test a path model in which protein intake before the age of 6 has both direct and indirect effects through IGF-1 and DHEA on cognitive status.

Results

We have no results at present.

Conclusion

This study will help to determine if changes in DHEA represent one potential mechanism by which stunting leads to changes in cognitive development

Growth in children between 2- 7 years of age: Evidence from Ola Tuputupua'e "Growing Up" in Samoa cohort study

Courtney C Choy	Brown University, USA
William Johnson	Loughborough University, UK
Stephen T McGarvey	Brown University, USA
Dongqing Wang	University of Michigan, USA
Take Naseri	Ministry of Health, Samoa
Christina Soti-Ulberg	Ministry of Health, Samoa
S Reupena	Lutia i Puava ae Mapu i Fagalele, Samoa
Rachel L Duckham	Deakin University, Australia
Nicola L Hawley	Yale University, USA

Introduction

The Ola Tuputupua'e "Growing Up" in Samoa study is the first cohort established among the Pacific Island countries. We aim to document the growth of these children between 2-7 years of age and examine variations by urbanicity and diet.

Methods

Data were from 456 Samoan children with measurements taken in 2015 (at 2-4 years) and 2017-2018 (at 3.5-7 years) across three census regions with varying urbanicity: Apia urban area, Northwestern Upolu (peri-urban), and Rest of Upolu (rural). Adherence to a modern dietary pattern with energy-dense, high-fat foods was identified using factor analysis. Z-scores were calculated based on WHO growth standards and references. Multilevel models were used to examine the relationships of urbanicity and diet with weight, height, and body mass index (BMI) z-score trajectories between 2 and 7 years of age.

Results

Compared to the WHO standard, children had a greater weight (median :0.20 SD, IQR: 1.39) and BMI (median: 0.99, IQR: 1.18), but lower height (median: -0.66 SD, IQR: 1.70) at 2-4 years of age. Weight and BMI remained above the reference median (0.40 and 0.65 SD, respectively), while height was 0.12 SD below the median at 5-7 years of age. On average, children gained 0.07 SD in weight (95%CI: 0.04, 0.10) and 0.29 SD in height (95%CI: 0.25, 0.34), but decreased by 0.16 SD in BMI (95%CI: -0.21, -0.12) for every 1-year increase in age and this did not vary by urbanicity and modern dietary pattern adherence.

Conclusion

Samoan children show higher weight and BMI for age, but slower height gain compared to the WHO standard and reference population. Despite differential exposure to urbanicity and diet modernization, children experience similar growth between 2-7 years of age.

Growth at adolescence: Tanner's legacy and recent SITAR insights

Tim Cole UCL Institute of Child Health, UK

Introduction

James M. Tanner's career spanned the latter half of the 20th century, dramatically advancing our understanding of growth and development. His favourite research topic was growth at adolescence, the title of his first book. He emphasised the "tempo" of growth, where the pubertal growth spurt is summarised by peak velocity (PV) and age at peak velocity (APV). The talk will explore the fit of the SITAR growth curve model (2010) to the wide-ranging pubertal anthropometry data collected by Tanner and Whitehouse in the Harpenden Growth Study. It will also clarify the pattern of growth for early, average and late developers in puberty using data from the ALSPAC study.

Methods

SITAR models pubertal growth as a smooth mean curve with APV and PV fitted as subject-specific random effects on the age scale, and a random intercept on the measurement scale. Data on ten distinct anthropometric measurements in 371 boys and 248 girls aged 7-20 years from the Harpenden Growth Study were analysed, along with height and weight in 4975 boys and 4985 girls aged 8-20 years from the ALSPAC study.

Results

Mean APV for Harpenden boys ranged from 13.2 to 14.3 (mean 13.9) years for ten measurements, and for girls from 10.7 to 12.6 (mean 11.9) years. Peak velocity expressed as % per year lay in the narrow range of 5-8% (mean 6.0%/5.5% for boys/girls). Splitting the ALSPAC subjects into nine groups by APV, and each into five groups by PV, led to 45 groups each with ~100 subjects. The patterns of mean height and weight growth by group varied much more than predicted by the SITAR model.

Conclusion

SITAR works well to clarify pubertal growth. The disappointment is that Tanner did not live to see it in action.

Associations of childcare type, duration, and intensity with body mass index trajectories from 10 to 42 years of age in the 1970 British Cohort Study

Silvia Costa	Loughborough University, UK
David Bann	University College London, UK
Sara E Benjamin-Neelon	Johns Hopkins University, USA
Jean Adams	University of Cambridge, UK
William Johnson	Loughborough University, UK

Introduction

Attending childcare is related to greater childhood obesity risk, but there are few long-term follow-up studies. We aimed to examine the associations of childcare type, duration, and intensity with BMI trajectories from ages 10-42 years.

Methods

The sample comprised 8234 individuals in the 1970 British Cohort Study, who had data on childcare attendance (no, yes), type (formal, informal), duration (4-5, 3-3.99, 0-2.99 years old when started), and intensity (1, 2, 3, 4-5 days/week) reported at age five years and 32563 BMI observations. Multilevel linear spline models were used to estimate the association of each exposure with the sample-average BMI trajectory, with adjustment for sex, father's occupational class, and mother's age of leaving full time education. A combined duration and intensity exposure was also examined.

Results

Childcare attendance and type were not strongly related to BMI trajectories. Results for the combined exposure revealed additive effects of childcare duration and intensity. Among participants who attended childcare 1-2 days a week, those who started when 3-3.99 years old had a 0.197 (-0.004, 0.399) kg/m² higher BMI at age 10 years than those who started when 4-5 years old, and those who started when 0-2.99 years old had a 0.289 (0.049, 0.529) kg/m² higher BMI. A similar dose-response pattern for intensity was observed when holding duration constant. By age 42 years, individuals who started childcare at age 0-2.99 years and attended 3-5 days/week had a 1.356 kg/m² (0.637, 2.075) higher BMI than individuals who started at age 4-5 years and attended 1-2 days/week.

Conclusion

Children who start childcare earlier and/ or attend more frequently have greater long-term obesity risk.

Radiographic alveolar ridge attainment of permanent teeth in Children from Sudan

Fadil Elamin Khartoum Centre for Research and Medical Training, Sudan
Helen Liversidge Queen Mary University of London, UK

Introduction

Clinical tooth eruption is defined as the first evidence of tooth emergence of the crown through the gingiva into the mouth. Studies report it to be earlier in African groups to others with different ethnic background or origin. Assessing eruption from radiographs presents clearer and more detailed reference points, such as the alveolar crest and roots, and is thought to be less variable compared to clinical emergence. No studies describe alveolar eruption from Africa.

Aim

To describe alveolar ridge attainment for children from Sudan and compare them to other groups with different ancestry.

Methods

Alveolar ridge attainment, of all mandibular and maxillary teeth on the left side, was assessed from dental radiographs, in teeth and 782 children (452 males, 330 females), from a dental practice in Khartoum. The children were equally distributed across age (3-23 years). The left maxillary and mandibular permanent teeth scored in relation to alveolar ridge bone. Mean age was calculated using probit regression analysis. Males and females were compared using student t-test.

Results

Mean ages at entry of alveolar eruption were similar males and females ($p>0.05$). Only males were compared in this study. Alveolar eruption was similar between males from Sudan and children from London. Mean alveolar times are presented for all teeth.

Conclusion

This is the first study to present data from African groups and shows that eruption is similar in 2 geographically distinct regions. No studies on alveolar eruption exist from African to enable comparison. Further studies are required to investigate why Africans are advanced in clinical emergence but not radiographic alveolar crest attainment.

Effects of prenatal stress on lactation and offspring development: linking evolutionary models with human cohort studies

Sinead English	University of Bristol, UK
India Wright	University of Bristol, UK
Verity Ashburn	University of Bristol, UK
Gemma Ford	University of Bristol, UK
Doretta Caramaschi	University of Bristol, UK

There is current debate on whether maternal stress primarily imposes costs on offspring development (constraint hypothesis) or serves as a cue to prepare them for stressful environments (programming hypothesis). These different hypotheses generate several predictions on how maternal stress may influence offspring development. Much research in testing the link between stress and development has focused on exposure *in utero*, yet maternal stress can have delayed effects through reduced investment during lactation. Moreover, while there have been several studies exploring the link between prenatal stress, maternal investment and offspring development across mammals – mainly primate and rodent laboratory models – fewer studies have explored these processes in humans using cohort studies. Here, we present, first, an evolutionary framework to generate testable predictions on how maternal stress might impose constraints on, or adaptively programme, offspring development and we then interrogate these predictions using a UK birth cohort dataset.

Changes in trajectories for blood pressure among Chinese children and adolescents: evidence from China Health and Nutrition Survey 1991-2015

Mingyue Gao University College London, UK
Jonathan Wells University College London, UK
Leah Li University College London, UK

Introduction

High adult blood pressure (BP) is an important risk factor for cardiovascular disease (CVD) and mortality. Childhood BP tracks into adulthood. Little is known whether BP trajectories in children have changed over time, as BP is strongly associated with body-size, especially in countries with rapid economic growth. We investigated whether BP trajectories have changed among Chinese children and whether changes can be explained by BMI and height trends

Methods

China Health and Nutrition Survey (eight waves 1991-2011) was used to create four cohorts (7-17y, born in 1981-85, 1986-90, 1991-95, 1996-2000, N~16000). Multilevel cubic functions were applied to estimate child-to-adolescent trajectories for systolic and diastolic BP (SBP and DBP) with and without adjustment for BMI and height (age-/gender standardised z-scores). Between-cohort differences were examined by testing the interactions of each cohort with age terms.

Results

Trajectories for SBP increased across cohorts: those for later-born cohorts tended to lay above early-born cohorts in both sexes. After the adjustment differences mean SBP reduced. The reduction was more evident in adolescence (vs childhood) and with adjustment for height (vs for BMI) trajectories. For example, the difference between the last (born 1996-2000) and first (1981-85) cohorts was 1.90mmHg (95% CI: 0.54-3.26) for boys and 2.58 mmHg (95% CI: 1.18-3.98) for girls at 7y, and there was no difference at 16y after adjustments. Similar patterns were seen for DBP.

Conclusion

Trends for BP in recent decades among Chinese children and adolescents were partly explained by more rapid growth in height and BMI in later-born children.

Common mental health problems and cognitive ageing

Amber John	University of Sussex, UK
Georgina Bell	University of Sussex, UK
Jennifer Rusted	University of Sussex, UK
Marcus Richards	University College London, UK
Darya Gaysina	University of Sussex, UK

Introduction

Common mental health problems (CMHP), such as symptoms of depression and anxiety, are often comorbid with dementia. It is estimated that 40% of people with dementia also experience CMHP. Research has also shown longitudinal associations between CMHP and cognitive function, however, the majority of research has focused on older samples (aged 60+) with short follow ups (<10 years). Less is known about how the association between CMHP and cognitive function operates over a longer period of time, and earlier in the life course.

Methods

The nature of this complex association across the life course is explored by utilising data from two national British birth cohorts: the National Survey of Health and Development, and the National Child Development Study.

Results

First, it was demonstrated that adolescent, but not adult CMHP significantly predicted poorer baseline memory and information processing speed scores, but not rate of decline over time. Second, CMHP significantly predicted subsequent level of memory and processing speed over a 16-year period, but that this association did not operate in the opposite direction. Third, accumulation of persistent CMHP, rather than sensitive periods, could better predict midlife cognitive function. Fourth, inflammation (as measured with C-reactive protein level) was shown to be an important mediator of the association between CMHP and cognitive function. Finally, a number of potential moderators of this association were found to contribute to risk and resilience pathways.

Conclusion

Taken together, our results suggest that accumulation of CMHP over the life course predicts later cognitive function, and reveal some important mediators and moderators of this link.

In search of excellence in youth basketball players. Study design and baseline results of the INEX project

Eduardo Guimarães University of Porto, Portugal
Adam Baxter-Jones University of Saskatchewan, Canada
Manuel Janeira University of Porto, Portugal
José Maia University of Porto, Portugal

Introduction

Youth sports excellence is the result of complex interactions of genetic material and environmental factors. Although such interactions are accepted as determinants of players' development, apparently no coherent research agenda has integrated young players' skills and aptitudes within their family support systems, coaches' levels of expertise or clubs' contexts. To address these issues longitudinal data is required to tweeze out the independent effects of each variable. This study presents the overall design of the project In search of excellence in sport - a mixed-longitudinal study in young athletes (INEX), its methodology, and reports baseline results of the basketball cohort.

Methods

Two hundred and thirty-eight male basketball players, aged 11-15 years, were recruited from the INEX project, coming from 19 clubs of the Porto Basketball Association. Players were assigned to five age-cohorts (C1=11y, n=41; C2=12y, n=56; C3=13y, n=47; C4=14y, n=53; C5=15y, n=41). Data were clustered into three domains: (i) biological (anthropometry, body composition, maturation, and performance), (ii) skill/game proficiency (technical and tactical skills), and (iii) contextual (clubs' characterization and organization, infrastructures and equipment, human resources, and communication).

Results

Baseline results by cohort of the INEX basketball sample from all variable domains will be presented.

Conclusion

It is expected that such extensive and integrated approach to youth basketballer's development will provide an important body of knowledge and information for players, parents and coaches.

Life course biological trajectories in cohort studies

Rebecca Hardy CLOSER, UCL Institute of Education, UK

Continuous and normally distributed measures of body structure and function, measured repeatedly over time, provide dynamic tools for investigating development, health and ageing across the life course, and for studying the biological imprint of exposures. It is of importance to understand normal life course age-related trajectories of such measures, and the factors that influence deviations from the norm. Signs of impaired function may act as intermediate markers of underlying disease processes, failure to reach developmental potential, or accelerated ageing, and offer opportunities for early intervention. Comparing trajectories across cohorts born at different times and in different places may offer additional insight into the effects of social context.

There are a number of key challenges in maximising the use of life course biological trajectories across cohorts. Harmonisation of measures, both within a cohort over long periods of time and at different ages, as well as between cohorts, is required. The frequency with which repeated measures are collected within cohorts must balance costs and the burden on participants against the scientific rationale where the timing of measurement should reflect the velocity of change in the phenomena under study. As most cohort studies currently have measures at widely spaced intervals across life, research has tended to focus on study of smooth average long-term changes, with less attention paid to shorter-term changes and fluctuations. Innovations in technology could allow data to be collected on more frequent schedules of assessment.

Samoan mother's perception of infant hunger and food enjoyment, and association with continuation of exclusive breastfeeding: Fofoaga O Le Ola study

Victoria Harries	Yale University, USA
Kendall Arslanian	Yale University, USA
Ulai T Fidow	Tupua Tamasese Meaole Hospital, Samoa
Theresa Atanoa	University of California-Santa Cruz, USA
Folla Unasa-Apelu	Yale-Ministry of Health Research Centre, Samoa
Take Naseri	Ministry of Health, Samoa
Nicola L Hawley	Yale University, USA

While initiation of breastfeeding is high in Samoa (94%) with median duration of 21 months, exclusive breastfeeding [EBF] declines after 2 months of age from 75% to 55% at 4-5 months. Little is known about correlates of breastfeeding cessation, particularly how mother's perception of infant satiety, and food responsiveness influences continuation of EBF.

Anthropometric and questionnaire data were collected at eight- [8w], and 16-week [16w] time points from 93 mother-infant dyads recruited into the Samoan "Fofoaga O Le Ola" birth cohort study in 2017. T-tests were used to compare mean Baby Eating Behavior Questionnaire scores [8w] between mothers whose infants were and were not EBF at 16w.

EBF declined among the sample from 76.3% at 8w to 65.6% at 16w. Infants who were EBF at 16w scored higher on the 'pleasure from food' scale at 8w than those who were not (4.8 ± 0.3 vs. 4.5 ± 0.6 ; $p=0.0006$). EBF infants also had higher scores for the individual items 'wanting more milk than the mother could provide' (3.9 ± 1.1 vs. 3.7 ± 1.7 , $p=0.01$) and 'loving milk' (5.0 ± 0.3 vs. 4.0 ± 1.7 , $p=0.004$). Infants who were not EBF at 16w had marginally lower satiety scores at 8w, compared to EBF infants (1.5 ± 0.8 vs. 1.8 ± 0.9 , $p=0.055$).

Mother's perception of infant's satiety, hunger for, and pleasure from food at 8w was associated with exclusivity of breastfeeding at 16w. Mothers who perceived their child at 8w as gaining less pleasure from food, not loving or wanting more milk, and not being satisfied by feeds were less likely to continue EBF until 16w. This information may be useful in developing interventions to support prolonged EBF. Further analysis should consider gender and birth order differences.

Data linkage methods in cohort studies

Katie Harron University College London, UK

Data linkage is an important tool for increasing the value of existing longitudinal studies. Linkage to multiple data sources can provide a low-cost, efficient means of collecting extensive and detailed data on cross-sectoral services, society, and the environment, as well as augmenting direct data collection through linkage with biological samples, social media and other digital sources. These data can be used to supplement traditional cohort studies, or to create population-level electronic cohorts generated from administrative data. Such administrative data cohorts offer the ability to answer questions that require large sample sizes or detailed data on hard-to-reach populations, and to generate evidence with a high level of external validity and applicability for policy-making. There is increasing interest in using these two models of data collection in conjunction, combining population-level administrative data with detailed attribute data collected directly from participants, in order to provide a deeper insight into what determines our health. Lack of access to unique or accurate identifiers means that linkage is not always straightforward. Errors occurring during linkage (false-matches and missed-matches) can lead to substantial bias in results based on linked data. This issue is compounded by difficulties in evaluating linkage quality or determining the potential impact of errors on results due to the separation of linkage from analyses of linked data. This talk will give an overview of the opportunities, challenges and methods for using data linkage in cohort studies.

Cohort Profile: The ‘Ola Tuputupua’e’ (Growing Up) Study, Samoa

Nicola L Hawley	Yale University, USA
Courtney C Choy	Brown University, USA
Christina Soti-Ulberg	Ministry of Health, Samoa
Muagututia Sefuiva Reupena	Lutia I Puava Ae Mapu I Fagalele, Samoa
Rachel L. Duckham	Deakin University, Australia
Take Naseri	Ministry of Health, Samoa

Introduction

The Ola Tuputupua’e (“Growing Up”) cohort was established to understand the burden of malnutrition among Samoan children, identify critical periods for intervention, and support government policy making to promote child health.

Methods

Two waves of biannual data collection (2015 and 2017/18) have been completed, with a third ongoing. The n=509 mother-child pairs enrolled represent 11 villages of varying urbanicity on the Samoan island of Upolu. Body size and composition are assessed with anthropometry and dual-energy X-ray absorptiometry (DXA). Questionnaires assess family socio-economic status, household characteristics, and dietary intake. Physical activity is measured using accelerometry. Community level GIS mapping is currently being completed.

Results

Key findings to date include: (1) dramatically increased prevalence of childhood overweight/obesity between the first (2-4 years; 16.1%) and second (4-6 years; 32.6%) data collection waves; (2) a high prevalence of childhood anemia (33.8-34.1%) that often co-occurred with overweight/obesity; (3) a worrisome prevalence of prediabetes (HbA1c \geq 5.7%; 24.1%) in a randomly selected subset of the cohort (n=42; 3.5-7 years old) and (4) poor correlation between BMI z-score and DXA-measured percent body fat, indicating the need to further examine measures currently used to assess cardiometabolic risk.

Conclusion

The first longitudinal study of child health to be established in the Pacific Islands, the Ola Tuputupua’e study is already generating information to inform cardiometabolic disease prevention among Samoan children. Collaboration with the Samoan Ministry of Health is ensuring that information is used in a timely manner to inform policy decisions.

Prenatal factors of variation of cord blood hormones in the EDEN mother-child cohort

M Taine	Paris Descartes University, France
J Delpout	Paris Descartes University, France
A Forhan	Paris Descartes University, France
N Gleichenhaus	Institut de Pharmacologie Moléculaire et Cellulaire, France
O Khalfallah	Institut de Pharmacologie Moléculaire et Cellulaire, France
M Piketty	Hôpital Necker Enfants Malades, France
MA Charles	Paris Descartes University, France
J Beltrand	Paris Descartes University, France
B Heude	Paris Descartes University, France

Introduction

Metabolic programming occurs early in life and is influenced by genetics and in utero nutritional environment. Our aim was to investigate prenatal determinants of IGF-1, c-peptide, leptin in cord blood with a particular focus on the role of child prenatal growth and parental anthropometry including their own birth weight.

Methods

This study included 1366 term born newborns from the EDEN cohort for whom leptin and c-peptide were measured in cord blood (CB). CB IGF-1 measurement was also available for 573 of them. We used conditional growth modeling on 3 time points (estimated fetal weights at 22 and 32 gestational weeks and birth weight) to characterise 3 prenatal growth periods. Parents' birthweights and their anthropometry were collected by interview or measured when possible. Pregnancy risk factors were collected from obstetrical files. For each hormone, 2 multiple linear regression models were used, without and with fetal growth. Multiple imputations were used to address missing data.

Results

Fetal growth was positively associated with each CB hormone, only the first period was not associated with c-peptide. Maternal birthweight was positively associated with leptin before accounting for fetal growth but not after. Pregestational body mass index was positively associated with leptin and c-peptide and negatively with IGF-1. Parental height was negatively associated with leptin. Paternal birthweight was negatively associated with c-peptide. Accounting for fetal growth did not change these results.

Conclusion

These original findings on the association between parental anthropometry and the newborn metabolism support the hypothesis of a transgenerational character of metabolism programming.

Common health conditions in childhood and adolescence, educational attainment and absenteeism in the Avon Longitudinal Study of Parents and Children

Amanda Hughes University of Bristol
Neil Davies University of Bristol
Laura Howe University of Bristol

Introduction

Health in childhood is patterned by socioeconomic background, but also influences later socioeconomic outcomes. This suggests a role for childhood health in intergenerational transmission of (dis)advantage, but presents challenges for identifying causal processes. Using genetic instrumental variables for health (Mendelian Randomization) can circumvent these difficulties.

Methods

In 7898 children born in the Bristol area in 1991-1992, we investigate impact on educational attainment of 6 aspects of childhood health (depressive symptoms, attention-deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), asthma, body mass index (BMI), migraines) using polygenic risk scores (PGSs). With linked educational records, we explore associations of health in late primary school (age 10-11) and mid-secondary school (age 13-14) with GCSEs at 16., and 2) whether absenteeism mediates associations, offering a point for intervention. We investigate mediation by absenteeism, and complement analyses with summary-level two-sample MR. Objectives were 1) to determine which aspects of childhood health causally impact attainment

Results

Genetic liability for higher BMI and ADHD were associated with lower GCSE results. Two-stage least-squares models of measured BMI and ADHD symptoms also support negative effects. There was little evidence for impact of depressive symptoms, ASD, asthma or migraine, but weaker instruments, especially for ASD, may have affected results. The polygenic scores did not predict absenteeism. Results of summary-level MR were largely consistent with main results.

Conclusion

Results support a causal impact of some aspects of childhood health (BMI and ADHD symptoms) on educational attainment.

Differences in the relationship of weight to height, and thus the meaning of BMI, according to age, sex, and birth year cohort

William Johnson	Loughborough University, UK
Tom Norris	Loughborough University, UK
David Bann	University College London, UK
Noel Cameron	Loughborough University, UK
Jonathon K Wells	University College London, UK
Tim J Cole	UCL Institute of Child Health, UK
Rebecca Hardy	CLOSER, UCL Institute of Education, UK

Introduction

We aimed to investigate how the weight-height relationship, captured by the Benn parameter (kg/m^B), changes across age (10-65 years) and time (1956 to 2012) and differs between sexes and individual children.

Methods

The samples comprised 4,724 participants in the 1946 National Survey of Health and Development (NSHD), 16,307 in the 1958 National Child Development Study (NCDS), and 15,437 in the 1970 British Cohort Study (BCS). For each sex and cohort, we modelled log weight against log height in a multilevel framework, allowing the log height (i.e., Benn) parameter to change flexibly over age. In models restricted to childhood data in the NSHD and NCDS, we also allowed the Benn parameter to vary between individuals.

Results

The Benn parameter was closest to two in childhood but was consistently lower across adulthood, particularly in females and the most recently born cohort (e.g., ~ 1.2 in adult females in the BCS). In the childhood models, in which a Benn parameter is estimated for each child based on the relationship between their serial weight and height data, heavier children tended to need a lower height scaling power. This correlation was weaker in the NCDS than the NSHD (e.g., -0.902 vs -0.199 in males), reflecting a decline in the weight-height correlation over time.

Conclusion

The BMI may not properly capture the weight-height relationship at the population- or individual-level. Groups of individuals with high levels of adiposity may have BMI values that are systematically too low because the correct height scaling power is closer to one than two.

Characteristics of Ultradistal Radius Bone Density during Childhood: Results from the Bone Mineral Density in Childhood Study

Joseph M Kindler	The Children's Hospital of Philadelphia, USA
Jonathan A Mitchell	The Children's Hospital of Philadelphia, USA
Shana E McCormack	The Children's Hospital of Philadelphia, USA
Diana L Cousminer	The Children's Hospital of Philadelphia, USA
Alessandra Chesi	The Children's Hospital of Philadelphia, USA
Andrea Kelly	The Children's Hospital of Philadelphia, USA
Joan M Lappe	Creighton University, USA
Vicente Gilsanz	Children's Hospital Los Angeles, USA
Sharon E Oberfield	Columbia University, USA
John A Shepherd	University of Hawaii, USA
Karen K Winer	National Institutes of Health, USA
Heidi J Kalkwarf	Cincinnati Children's Hospital Medical Center, USA
Struan FA Grant	The Children's Hospital of Philadelphia, USA
Babette S Zemel	The Children's Hospital of Philadelphia, USA

Introduction

Forearm fractures are common in childhood, and can result from inadequate bone strength. To evaluate UD radius aBMD as an indicator of bone strength, the objectives of this study were to 1) assess relationships between UD radius aBMD and a) other DXA aBMD measures and b) radius bone geometry by pQCT, and 2) examine the stability of UD radius aBMD over time.

Methods

Data were from the longitudinal Bone Mineral Density in Childhood Study (n=2014, 922 males, 22% African American) of healthy children ages 5-19 yrs, who provided >10,000 DXA measurements over 6 yrs. In a subset (n=144), distal radius pQCT scans were acquired at the distal 3% and 30% sites. Reference data were generated using the LMS method. Relationships between UD radius aBMD and age, sex, ancestry, and bone measures were assessed using mixed effects regression and partial correlations. Tracking was assessed using Pearson's correlations.

Results

UD radius aBMD increased non-linearly with age and was greater in African Americans and males (all $P < 0.001$). UD radius aBMD Z-scores correlated positively with aBMD Z-scores at all measured sites ($r = 0.56-0.64$, all $P < 0.001$). Partial correlations (accounting for age, age², gender and African American ancestry) between UD radius aBMD and pQCT measures of total and trabecular volumetric density were $r = 0.53$ and 0.45 ($P < 0.001$), respectively. UD radius aBMD Z-scores tracked strongly over 6 years ($r = 0.69$, $P < 0.05$).

Conclusion

The UD radius is an appendicular region of mostly trabecular bone. UD radius aBMD was moderately associated with pQCT measures of trabecular volumetric BMD, and with other DXA measures. Further studies are needed to determine if UD radius aBMD Z-scores predict forearm fractures in youth.

Growth standards of Brahman/Chhetri and Newar/Janajati in Nepal

S Kokudo	Kobe University, Japan
T Sagawa	Kanazawa University, Japan
T Nakano	Nagoya Gakuin University, Japan
K Ueda	Minatogawa College, Japan
B Devkota	Tribhuvan University, Nepal
K Adhikari	Tribhuvan University, Nepal
U Acharya	Tribhuvan University, Nepal

Introduction

There are caste and ethnic groups in Nepal. Brhaman/Chhetri (B/C) is a major group of caste and Newar/Janajati (N/J) is a major adivasi (indigenous) group. Growth status of these groups has never been compared. Moreover, growth standard of Nepali children have not been presented to date. The purposes of this study were to compare their growth stats and integrate growth standard curve of B/C and N/J in Nepal.

Methods

Height and weight of 2,787 boys and 2,936 girls, 5,723 children in total, which included 1,997 B/C children and 3,319 N/J children aged 5-19 years, were measured from 2014 to 2018 at both urban and rural area in Kathmandu Valley and Pokhara City in Nepal. LMS method was applied to draw the growth standard curves (3,10,25,50,75,90, and 97th percentile) height, weight and body mass index (BMI) by age.

Results

Median of height was 111.4cm at 6-yr of age and 166.8cm at 18-yr of age for B/C boys and 108.9cm at 6-yr of age and 164.2cm at 18-yr of age for N/J boys, 110.8cm at 6-yr of age and 156.0cm at 18-yr of age for B/C girls and 107.8cm at 6-yr of age and 151.6cm at 18-yr of age for N/J boys. All height percentile curves of B/C were slightly higher (approx. 2-3cm) than N/J, though the shapes were similar to both groups for boys and girls till 16 years old. Weight percentile curves were identical between B/C and N/J for boys and girls, 55.1kg for boys and 48.6kg for girls at 18-yr of age. BMI of N/J was smaller than B/C. Their body size was similar to other Asian countries but smaller than European or WHO standard.

Conclusion

The growth standard curves of Nepali children were developed properly. The growth standard shall be developed separately in Asian countries.

Integrating evolutionary theory into longitudinal cohort studies: Insights from a birth cohort in the Philippines

Christopher Kuzawa Northwestern University, USA

Longitudinal cohort studies provide unprecedented opportunities to address questions about growth and aging, including the links between early life experiences and health across the lifecourse. Life history theory (LHT) is a branch of evolutionary biology that studies the relationships between growth, reproduction, and aging and is thus a useful organizing framework, and source of testable hypotheses, for cohort studies. Several assumptions of LHT are particularly relevant to human studies. First, the body's ability to harvest and distribute metabolic resources is finite, leading unavoidably to trade-offs between functions. One example is the trade-off between reproductive effort and somatic maintenance that slows senescence. Because repairing and maintaining the body's tissues to extend late life function only makes sense if that individual is likely to live into the future, organisms are predicted to adjust patterns of allocation in response to cues reflecting unavoidable mortality. Another assumption of LHT is that metabolic resources in excess of maintenance needs are available for "productivity", which manifests first in growth, and later in adulthood as offspring growth (females) or in costly, sexually dimorphic traits and behaviors (males). This paper will review the application of these and other principles of LHT to analysis of data from the Cebu Longitudinal Health and Nutrition Survey, a large prospective cohort study in the Philippines that spans more than 3 decades. At Cebu, LHT-inspired work has illuminated issues like the connections between growth and reproduction, the early life experiences that motivate adult reproductive behavior, and the links between reproduction and aging.

Cross-context similarities in growth in HIV-exposed and -uninfected infants: a comparison of the growth trajectories in the BAN and Kabeho studies

Charlotte Lane University of North Carolina, USA

Linda Adair University of North Carolina, USA

Introduction

With the success of treatment for HIV, mother-to-child transmission of the disease is decreasing. Increasingly, efforts are being focused to support the health and wellbeing of the HIV-exposed and -uninfected (HEU) infants born to HIV-positive women.

Methods

We pooled data from two studies of HEU infants: the BAN study in Malawi (n=530) and the Kabeho study in Rwanda (n=563). We then use SITAR and latent class growth mixture modeling to determine if infants from the two countries experience similar patterns in linear and ponderal growth.

Results

Infants from the Malawi cohort had, on average, smaller size than Rwandan infants; however, growth velocity was similar. Each latent class was composed of 40-60% infants from each cohort, except for the largest class, which was predominantly infants from Rwanda. Increasing maternal height was related to increased odds of being in the heaviest and tallest classes of infants. Among Rwandan infants, maternal height was also related to increased size in length and weight. Increasing neonatal WAZ was associated with increased odds of being in the largest growth classes as well. Neonatal WAZ was also positively related to size in length and weight and accelerated ponderal growth. These effects were most pronounced among Malawian infants.

Conclusion

Although there are some similarities in the growth patterns of the HEU infants in these two settings, the effects of risk factors for poor growth, such as short maternal stature and low neonatal WAZ, are not the same across settings. These findings highlight the importance of contextual considerations when designing interventions in new contexts.

Investigating isotopic profiles of human auditory ossicles

Tamara Leskovar University of Ljubljana, Slovenia
Julia Beaumont University of Bradford, UK
Nidia Lisić Museum of London Archaeology, UK
Suzanne McGalliard MOLA Headland Infrastructure, UK

In bioarchaeological sciences, skeletal remains are often the only still preserved part of the decomposed body. Human nutrition and health can thus only be studied through bones and teeth, commonly with the isotopic analyses of their collagen. As teeth do not remodel, the collagen of primary dentine contains the isotopic data from the time of formation. On the other hand, bones remodel throughout life and their isotopic values represent an average of several years. One exception to the bone remodelling rule are human auditory ossicles. They develop in utero and finish forming in the first two years of life. In theory, their collagen should represent the isotopic values of these two periods. However, as isotopic profiles of human auditory ossicles were never studied before, it is not clear if this is true. As a step towards resolving the issue, we compared $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of collagen from ossicles with collagen from teeth that form at approximately the same time. 12 individuals aged 0.5 ± 0.4 years to 13 ± 1 years from the 19th century St. Peter's burial ground in Blackburn were included in the study. An ossicle and a tooth were collected from each individual and their collagen analysed for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$. Results obtained from the ossicle were then compared with the results from tooth increments. A significant and systematic offset between ossicles and dentine formed at the approximately same time was noticed. Based on the comparisons, it seems that the second, post-natal phase of the ossicle development does not influence the isotopic values of collagen significantly. Results indicate that data stored in the collagen of human auditory ossicles mostly reflects the in-utero period.

Low IGFBP-1 is associated with adiposity but not change in adiposity from midlife to old age in the Swedish Adoption/Twin Study of Aging

Moira S Lewitt University of the West of Scotland, UK
Ida Karlsson Karolinska Institutet, Sweden
Nancy L Pedersen Karolinska Institutet, Sweden

Introduction

The Swedish Adoption/Twin Study of Aging (SATSA) is a population-based cohort of same-sex twins (n=859) established in 1984 by recruiting twins who were reared apart from the Swedish Twin Registry, and an age-matched sample of twins reared together. At baseline, the heritability estimate for fasting insulin-like growth factor-binding protein (IGFBP)-1, a marker of insulin sensitivity, was 36% and for IGF-I, a nutritional marker, 63%. SATSA is longitudinal, with nine waves of extensive in-person testing over a 30-year period. The aim of this study was to determine the relationship between baseline IGFBP-1 and IGF-I levels, and lifetime trajectories of weight and waist measurements.

Methods

Latent growth curve modelling with age centred at 73 y was used to determine whether BMI (weight(kg)/height(m)²) and WHtR (waist(cm)-to-height(m) ratio), and their change, differed as a function of baseline fasting IGFBP-1 and IGF-I. Sex and birth cohort (1900-17, 1918-25, 1926-48) were included as covariates. Between- and within-twin pair effects, rearing status and zygosity were included in the models.

Results

BMI, and to some extent WHtR, changed curvilinearly with age. Lower IGFBP-1 was significantly associated with higher BMI and WHtR (1.8kg/m² and 3 cm/m, respectively, per unit decrease in log-IGFBP-1) at age 73 y, but not with rate of change. The associations were weakened, but remained, after adjustment for insulin. Twin models indicate part of the association is explained by genetic factors. There was no relationship between IGF-I and BMI or WHtR levels or rate of change.

Conclusion

Lower fasting IGFBP-1 levels are associated with increased adiposity, but not change in adiposity, across the lifespan.

Changes in life-course BMI trajectories in Chinese population

Leah Li University College London, UK

Evidence on secular trends in life course BMI trajectories is limited, especially in countries that are experiencing marked socio-economic and nutritional transitions. We investigated how life course BMI trajectories have changed across recent generations in China. We used the mixed longitudinal data from the China Health and Nutrition Survey (CHNS), which has so far had ten waves between 1989 and 2015 (N~30,000). We derived multiple cohorts born in five-year intervals between 1945 and 2004 and fitted fractional polynomial models with random effects to child-to-adult BMI, from 7y up to 70y.

Mean BMI trajectories increased over time, with later born cohorts having higher BMI and their mean BMI exceeded the normal BMI range (i.e. $<25\text{kg/m}^2$) from early adulthood, compared to older cohorts. Comparing boys born 20 years apart in 1980-84 and 2004-04, mean BMI increased by 1.2kg/m^2 at age 7y, increasing to 3.2kg/m^2 at age 15y. The corresponding increases for girls were 2.1kg at both ages. The subsequent increases in adult BMI trajectories were greater for males than females until the old age. For example, mean BMI increased by 2.2kg/m^2 at 45y in males and by $\sim 1\text{kg/m}^2$ in females between cohorts born in 1950-54 and in 1970-74. At old age, the increase was similar for males and female (e.g. by $\sim 1\text{kg/m}^2$ in 60s).

Growth Curve comparisons to assess impact of HIV infection and ART on Head Circumference profiles of a cohort of South African infants

Francesca Little	University of Cape Town, South Africa
Barbara Laughton	University of Stellenbosch, South Africa
Ernesta Meintjes	University of Cape Town, South Africa
Mark Cotton	University of Stellenbosch, South Africa

The Children with HIV early antiretroviral trial (CHER) was aimed at investigating ART initiation strategies in infants and children in a resource limited setting in South Africa. The resulting cohort of infants followed up for a 36 months provided data on growth in anthropometric measurements, including head circumference that serves as a proxy measurement for brain size, especially before the age of two which is the period when almost all brain growth occurs. The aim of this analysis was to look at the impact of HIV infection and ART treatment on head circumference measurements, as a proxy for brain development, to assess the appropriateness of the WHO reference ranges for our cohort of healthy children, and to derive South African specific reference ranges using this cohort. We adopted a broken-stick growth model for the head circumference profiles by including piecewise linear splines in a mixed effect model for the impact of the ART strategies on head circumference profiles over age. The LMS method was used to calculate z-scores using the WHO reference ranges and the groups were compared with reference to these z-scores. Cohort specific percentiles and z-scores were calculated based on the Box-Cox Power distribution. The model illustrated the positive effect of ART treatment with children on early ART catching up faster to the HIV- children than children on delayed ART. The latter group started catching up as the children start using ART at later ages. Head circumference measurements for children included in the HIV-uninfected control groups were larger than expected based on WHO standards. Cohort specific derived reference ranges thus illustrated an upward adjustment of the percentile bands.

Does fecal regenerating 1B protein concentration predict growth in rural Malawian infants and children?

Zhifei Liu Tampere University, Finland

Ulla Ashorn Tampere University, Finland

Yue-Mei Fan Tampere University, Finland

Per Ashorn Tampere University, Finland

Introduction

Stunting in children is common in low-income countries. Approximately 39% of children in rural Malawi have "height for age" value less than two standard deviations of the WHO Child Growth Standards median. Intestinal biomarkers may be an effective way to assess child stunting. We aimed to determine whether fecal regenerating 1B protein (REG1B) concentration could be associated with physical growth among 6-30-month-old children in rural Malawi.

Methods

This was a secondary analysis from a randomised controlled trial in rural Malawi between February 2011 and April 2015. In the current study, 797 infants were followed up from birth to 30 months of age. We collected biological samples and anthropometrics from the participants at corresponding time points. We measured fecal REG1B concentration at 6, 18, and 30 months using ELISA kits. The association between REG1B concentration and children's physical growth was assessed using linear regression analysis.

Results

The mean REG1B concentration at 6, 18 and 30 months was 193, 105 and 58 $\mu\text{g/g}$ respectively. There was a significant but weak association between fecal REG1B concentration and head circumference-for-age z-score (Head-Z) either at 6 or 30 months. And there was also a significant weak negative association between REG1B concentration at 18 months and change in weight-for-age z-score (WAZ) from 12 to 18 months. No other positive associations were found between fecal REG1B concentration and anthropometric index at any age, nor between REG1B concentration and change in anthropometric index in the subsequent or preceding six-month period.

Conclusion

Fecal REG1B concentration does not predict physical growth among 6-30-month-old children in rural Malawi.

Nolla's longitudinal tooth formation data revisited

Helen Liversidge Queen Mary University of London, UK
Holly Smith George Washington University, USA
Lyle Konigsberg University of Illinois Urbana-Champaign, USA

Introduction

Most tooth formation reference data are based on radiographs taken in the course of diagnosis and dental treatment; however, re-analysis of a historical longitudinal radiographic study allows a more reliable description of the timing, variation in timing and the duration of consecutive tooth stages. One of the early longitudinal dental studies was by Carmen Nolla, who detailed permanent tooth formation in 25 boys and 25 girls from annual dental radiographs. The aim of our study was to reconstruct Nolla's longitudinal data and calculate the timing of permanent tooth stages.

Methods

The material for this study was data reconstructed from plots showing individual tooth stage curves from dental radiographs of 25 boys and 25 girls in Nolla's thesis (1952). These were assessed from annual radiographs taken from the ages of 2 to 18. We transcribed the data and calculated mean age of attainment of mandibular tooth stages in two ways. Firstly, data were treated as cross sectional and mean age calculated by probit regression. Secondly, data were analysed longitudinally by transition analysis using interval censoring. First results were compared to results from 946 dental radiographs of contemporary children aged 3-16.

Results

Our results show the timing of most tooth stages was similar to contemporary children. Some results of the longitudinal analyses could be compared to recently published reanalysis of longitudinal radiographic data and similarities were noted.

Conclusion

These findings suggest that the timing of permanent teeth is broadly similar between groups with little evidence of a secular trend.

The nature of nurture: how genetically sensitive cohorts have improved our understanding of gene-environment interplay in the development of obesity

Clare Llewellyn University College London, UK

Despite the ubiquity of the modern 'obesogenic' environment, we have not uniformly developed obesity. On the contrary, there is considerable variation in weight gain, which is observable from early infancy. In fact, it is not uncommon for siblings to vary considerably in their weight, even when they live in the same household. Obesity risk is about far more than just the environment we are exposed to. Genetic susceptibility to the environment is thought to explain some of the variation in adiposity. Nearly 100 twin studies have established that weight is a highly heritable trait (50-90%), and ~1000 common genetic variants (single nucleotide polymorphisms) have been discovered. Individual differences in appetite have been implicated as one of the mechanisms through which genes influence adiposity, so-called 'Behavioural Susceptibility Theory' (BST). BST hypothesises that individuals who inherit a set of genes that confer greater responsiveness to food cues (wanting to eat in response to the sight, smell or taste of palatable food), and lower sensitivity to satiety (fullness), are more vulnerable to overeating in response to the modern food environment, and therefore to developing obesity. At the same time, our environment is not simply an 'exposure' – we select and shape our environment to suit our preferences, many of which have some genetic basis (called gene-environment correlation). This talk summarises the interplay between genes, appetite and the home family environment in early weight gain, using data from Gemini and TEDS - two large, population-based British twin birth cohorts set up to study genetic and environmental influence on health and development.

Sex differences in frequency, but not timing of onset or diagnosis of pituitary gigantism: evidence from the Genetics of Endocrine Tumours study

Kesson Magid Queen Mary University of London, UK
Pedro Marques Queen Mary University of London, UK
Márta Korbonits Queen Mary University of London, UK

Introduction

Pituitary gigantism and acromegaly are phenotypic consequences of excess growth hormone (GH) secretion by tumours. Gigantism occurs during childhood before the closure of growth epiphyses and is predominant in males, while acromegaly is an adult condition and is generally evenly distributed between sexes. However, GH-secreting pituitary tumours may be sexually dimorphic or more likely during certain stages of development. If pituitary tumours form at a regular rate throughout life, we predicted significantly earlier timing of first symptoms and diagnosis of gigantism for female patients, greater number of diagnosed males, and greater age-adjusted incidence of acromegaly in females due to earlier cessation of childhood growth.

Methods

Demographic, hormonal, and ontogenetic characteristics were analysed within the Genetics of Endocrine Tumours study cohort of >3100 pituitary tumour patients and family members.

Results

Males comprised 153 (70%) of the 217 diagnoses of gigantism ($p < 0.001$), but were no more likely to be diagnosed with acromegaly, 395 (49.4%) of 799 cases ($p = 0.8$). However, males and females did not differ in terms of age (in years), at onset (14.0 ± 4.3 vs 14.6 ± 7.5 , $p = 0.6$) or at diagnosis for both gigantism (19.8 ± 8.1 vs 20.1 ± 9.6 , $p = 0.8$), and acromegaly (28.9 ± 10 vs 30.4 ± 12.3 , $p = 0.1$ and 34.3 ± 11.2 vs 34.8 ± 13.3 , $p = 0.6$, respectively).

Conclusion

The lack of sex differences in age at onset or diagnosis of rare disorders within a large cohort allows for insight into the ontogeny of human development, suggesting that hormonal or sex-linked traits explain the frequency, but not timing of GH-secreting pituitary tumours. We also consider ethnic, geographic and economic influences on diagnoses.

Health and socio-demographic predictors of treatment modality for gestational diabetes: evidence from the Born in Bradford cohort study

Gilberte Martine-Edith	Loughborough University, UK
William Johnson	Loughborough University, UK
Mark Hamer	Loughborough University, UK
Emily Petherick	Loughborough University, UK

Introduction

Gestational diabetes mellitus (GDM) management consists of advice on diet and exercise, followed by pharmacotherapy if hyperglycaemia persists. Previous studies have highlighted maternal differences between treatment groups however only a few of them involved metformin-treated patients, in a UK clinical setting. This UK-based study aimed to identify relationships between maternal characteristics and GDM treatment modalities.

Methods

Maternal records from Born in Bradford cohort participants receiving treatment for GDM during their singleton pregnancies were studied (N=727). Treatment groups consisted of lifestyle modifications (diet and/or exercise), pharmacotherapy (insulin and/or metformin) and combined treatment (lifestyle modifications and pharmacotherapy). Differences between groups were evaluated using Pearson's χ^2 and Fisher's exact tests for categorical variables and Kruskal-Wallis test for continuous variables. Multinomial logistic regression examined maternal predictors of GDM treatment.

Results

Mothers receiving lifestyle modifications (N=196) and combined therapy (N=209) were younger than mothers receiving pharmacotherapy (N=322). 57.4% of women treated with pharmacotherapy were obese compared to 17.7% and 24.9% of women in lifestyle modifications and combined therapy groups, respectively. Pakistani women were less likely to be treated with pharmacotherapy than lifestyle modifications (RRR 0.6(0.3-1.3)). Higher fasting glucose levels at diagnosis increased the risk of combined treatment compared to lifestyle modifications (RRR 1.9(1.3-2.6)).

Conclusion

Being older and having a less healthy clinical profile increased the risk of treatment involving insulin and/or metformin for women with GDM.

Using longitudinal data to understand nutrition and health interactions in rural Gambia

Sophie Moore Kings College London, UK

Introduction

The DOHaD hypothesis contends that exposures early in life can impact on lifelong health, especially in contexts where there is a 'mismatch' between the early and later life environment. Much of the evidence in support of DOHaD comes from studies in high-income countries using retrospective records, with less data from low-income countries. Here, I describe how we have used longitudinal data from rural sub-Saharan Africa to contribute to explore nutrition and human health interactions.

Methods

Using demographic records initiated in 1947 in rural Gambia, coupled with records on maternal and child health, we have explored; (i) the impact of the early-life nutritional environment on later health in a rural African population, and (ii) secular trends in childhood growth, with a focus on factors contributing to growth faltering.

Results

Firstly, building on epidemiological associations between season of birth and infection-related mortality, we have shown that the human immune system is sensitive to nutritional exposures early in life, adding a novel dimension to the DOHaD field. Secondly, using routine data on childhood anthropometry, we observe that, despite a significant decline in child undernutrition, rates remain unacceptably high, likely reflecting the very high socio-economic threshold required to eliminate undernutrition.

Conclusion

The foresight to establish demographic data collection over 7 decades ago, has provided longitudinal data enabling novel research within a traditional African context. The addition of detailed clinical records on maternal and child health is helping us to understand the factors driving child undernutrition in rural Africa, and to identify targets for intervention.

Complete and on-time routine childhood immunization: Determinants and association with severe morbidity in urban informal settlements, Nairobi, Kenya

Martin Mutua	African Population and Health Research Center, Kenya
Shukri Mohamed	African Population and Health Research Center, Kenya
Elizabeth Kimani-Murage	African Population and Health Research Center, Kenya
Lucy Kiarie	International Youth Alliance for Family Planning, USA
Cara Janusz	University of Michigan, USA
Peter Aaby	University of Southern Denmark, Guinea-Bissau
Ane Fisker	University of Southern Denmark, Guinea-Bissau
Elizabeth Echoka	Jomo Kenyatta University, Kenya
Henrik Ravn	University of Southern Denmark, Guinea-Bissau

Introduction

Completion of the full series of childhood vaccines on-time is crucial to ensuring protection against vaccine-preventable diseases. Health effects of the potential “non-specific effects” of vaccines are linked to vaccines timeliness. We examine determinants of complete and on-time vaccination and evaluates the relationship between vaccination patterns and severe morbidity outcomes

Methods

The paper uses data from maternal and child health survey which recruited and followed up a cohort of children born in the Nairobi Urban Health and Demographic Surveillance System between 2007 and 2014. Vaccination information were collected from child health cards. Logistic regression was used to identify determinants of vaccination completion and timeliness. Cox regression model was used to evaluate the relationship between vaccination statuses and subsequent severe morbidity. Several children reported more than one hospitalization episodes – a typical recurrent survival outcome. A frailty parametric cox model was fitted to account for the heterogeneity

Results

Maternal age, post-natal care, parity, ethnicity and residence place were identified as determinants of vaccination completion. Institutional deliveries and residence place were identified as the determinant of on-time vaccination. A significant 58% (CI: 15-79%) (p=0.017) lower mortality was observed among fully immunized children compared with not fully immunized. Lower mortality observed among on-time immunized children, 64% (CI: 20-84%) compared to those with delays

Conclusions

Improving vaccination timeliness and completion schedule is critical for protection against vaccines preventable diseases, and may potentially provide protection beyond these targets.

Is the relationship of adult obesity with cardiometabolic risk factors modified by age of onset, duration of exposure, and childhood growth patterns?

Tom Norris Loughborough University, UK
William Johnson Loughborough University, UK

Introduction

Obesity is a major cause of cardiometabolic disease but there is significant variability in risk factors between people with the same body mass index (BMI). The aim of this ongoing MRC-funded work is to understand how the well-known relationships of adulthood BMI and obesity with cardiometabolic disease risk factors might be modified by childhood growth and life course obesity patterns.

Methods

We have pooled weight and height (and thus BMI) data across the National Survey of Health and Development (NSHD, N=5,362, visits at ages 11, 15, 20, 26, 36, 43, and 53 years), the National Child Development Study (NCDS, N=18,558, visits at ages 11, 16, 23, 33, 42, and 44 years), and the British Cohort Study (BCS, N=19,101, visits at ages 10, 16, 26, 30, 34, 42, and 46 years). At the most recent sweep in each study, bloods were taken and used to define hypertension, low high-density lipoprotein cholesterol (HDL-C), high triglycerides, and high glycated haemoglobin (HbA1c). Childhood weight and height been summarised using age- and sex- specific Z-scores. Life course obesity patterns have been summarised from individual BMI trajectories as the following traits: age of onset, duration of exposure, number of periods, and AUC but above the cut-off. Poisson regression models are being developed to explore how the relationships of adulthood BMI and obesity with the number of risk factors (0-4) might be modified by these traits.

Results

We have no results at present.

Conclusion

This work will quantify heterogeneity in cardiometabolic disease risk among people with the same BMI or weight status, due to different childhood growth and life course obesity patterns.

The value of cohort studies for exploring the aetiology of child obesity

Ken K Ong University of Cambridge, UK

The Developmental Origins of Health and Disease hypothesis purports that early life factors determine long-term risks of death and disease. Prospective birth cohorts and more recently genetic studies consistently indicate that the rapid weight gain trajectory to later obesity starts in the first months of life, even from birth. Rapid infant weight gain and childhood overweight lead to earlier pubertal maturation in boys and girls, and in turn these adolescent traits are predictive for obesity, diabetes, hypertension and cardiovascular disease events in later life. Understanding of the nutritional, parental and wider determinants of rapid infant weight gain are informing the development of obesity prevention strategies starting in early life. These are important efforts in light the observed high levels of nutrition and weight in UK infants. However, many questions remain. Does rapid growth in infancy length ameliorate effects of rapid infancy weight gain on obesity risk? Conversely, do rapid gains in infancy adiposity exacerbate such effects and predict even worse metabolic health? As more accurate markers of infancy body composition and metabolism emerge and are incorporated into new cohort studies, do we have to wait for follow-up time to elapse before inferring their relevance to later obesity and disease risks? This paper will review what is currently known and consider how genetic epidemiological approaches might be used more widely to infer long-term relationships between early life growth and later outcomes.

The relationship of early-life adversity with adulthood weight and cardiometabolic health status in the 1946 National Survey of Health and Development

Ellie Robson	Loughborough University, UK
Wahyu Wulaningsih	The University of Edinburgh, UK
Tom Norris	Loughborough University, UK
Mark Hamer	Loughborough University, UK
Rebecca Hardy	CLOSER, UCL Institute of Education, UK
William Johnson	Loughborough University, UK

Introduction

Evidence linking early-life adversity with an adverse cardiometabolic profile in adulthood is equivocal. The current study investigates early-life adversity in relation to weight and cardiometabolic health status at age 60-64 years.

Methods

The study includes 1,059 individuals in the 1946 National Survey of Health and Development (NSHD). Data on adversity between ages 0-16 years were used to create a cumulative childhood psychosocial adversity score and a socioeconomic adversity score.

Cardiometabolic, weight, height, and body composition data collected at ages 60-64 years were used to create four groups: metabolically healthy normal weight (MHNW), metabolically unhealthy normal weight (MUNW), metabolically healthy overweight/obese (MHO), and metabolically unhealthy overweight/obese (MUO). Associations between the two exposure scores and weight/health status were examined using multinomial logistic regression, with adjustment for sex and age at the outcome visit.

Results

62% of normal weight individuals were metabolically healthy, whereas only 34% of overweight/obese individuals were metabolically healthy. In a mutually adjusted model including both exposure scores, a psychosocial score of ≥ 3 (compared to 0) was associated with increased risk of being metabolically unhealthy (compared to healthy) in both normal weight adults (RR 2.49; 95% CI 0.87, 7.13), and overweight/obese adults (1.87; 0.96, 3.61). However, the socioeconomic adversity score was more strongly related to metabolic health status in overweight/obese adults (1.60; 0.98, 2.60) than normal weight adults (0.95; 0.46, 1.96).

Conclusion

Independently of socioeconomic position, psychosocial adversity in childhood may be associated with a poor cardiometabolic health profile, in both normal weight and overweight/obese adults.

Challenges and opportunities identified in the Croatian Islands' Birth Cohort Study (CRIBS) pilot

Jelena Šarac Institute for Anthropological Research, Croatia

The CRoatian Islands Birth Cohort Study (CRIBS) was the first Croatian birth cohort study and the first birth cohort study ever conducted in Southeastern Europe, designed to prospectively follow a sample of 500 pregnant women and their children up to two years of age. The aim was to assess the prevalence of risk factors (biological, environmental and behavioural) for the development of metabolic syndrome (MetS) and other NCDs, in two Croatian islands (islands Hvar and Brač) and one mainland subpopulation (city of Split). Although birth cohorts and life course designs offer a wealth of opportunities, their implementation is uniquely challenging. Being the first birth cohort in Croatia, CRIBS faced certain methodological, logistical, and sociocultural challenges – including small sample size, incomplete data, problems with participant retention and lack of logistic support on the national level. The presentation will discuss such methodological shortcomings and highlight efforts of the CRIBS researchers to address them. Although limited in sample size, the success of the study lies in the wealth of collected data generating a great potential for cross-cohort collaborations and inclusion into larger consortia. However, this would not be possible without a personal contact with the participants, making it a challenge and opportunity at the same time.

Validating reproducibility of tooth development staging techniques based on the prediction of mature root lengths, using longitudinal data

Patrick Thevissen Leuven University, Belgium
Bara A Khalaf Leuven University, Belgium
Steffen Fieuws Leuven University, Belgium

Introduction

Diverse tooth development staging techniques use a prediction of the mature tooth root length as a reference to classify the observed tooth development. Proportions of the predicted mature root length are used as thresholds between the root stages. Longitudinal data permit to collect information of a specific tooth position while in development and while mature. This information allows to establish the exact tooth development stage thresholds for the considered subjects and can be used to validate observers' stage allocation performances.

Methods

Longitudinal tooth development data were extracted from 119 series of retrospectively collected digital dental panoramic radiographs. Each series included at least two radiographs from the same subject registered at different moments. The youngest radiograph contained mature and the older maturing second molars. All second molars were staged by six observers according to the technique of Köhler et al. The ratio between the second molar root length measured in the last and each previously recorded radiograph was calculated for each subject. The calculated range of second molar root length ratios that confirmed correct Köhler staging were as follows: range=0.25 to <0.50, Stage 5; range=0.5 to <0.75, Stage 6; range=0.75 to <1, Stage 7; ratio=1 (i.e., no range), Stage 8-10. The registered Köhler stages and the calculated ratios were independently verified for each second molar position and for each of the six observers.

Results

Verification of the calculated ratios and registered Köhler stages revealed that all observers generally classified the developing tooth in a more advanced stage than the correct stage, except for Stage 5.

Conclusion

Significant discrepancies in observer classifications of consecutive root stages were identified. It is proposed that tooth development staging techniques based on predictions of mature root lengths, should only be used after adequate observer training and calibration.

Childhood body size, growth and risks of systemic lupus erythematosus

Peter E Thomas	Bispebjerg and Frederiksberg Hospital, Denmark
Britt Wang Jensen	Bispebjerg and Frederiksberg Hospital, Denmark
Kathrine K Sørensen	Bispebjerg and Frederiksberg Hospital, Denmark
Søren Jacobsen	University of Copenhagen, Denmark
Julie Aarestrup	Bispebjerg and Frederiksberg Hospital, Denmark
Jennifer L Baker	Bispebjerg and Frederiksberg Hospital, Denmark

Introduction

Adult obesity may increase the risks of systemic lupus erythematosus (SLE), and there are genetic links between adult height and SLE. Thus, it is plausible that body size earlier in life may be important as well. Therefore, we investigated whether childhood body mass index (BMI [kg/m²]), height and growth are associated with adult SLE risks.

Methods

A cohort of 346,627 children (171,141 girls) from the Copenhagen School Health Records Register, born 1930-1996 with measured weights and heights from 7-13 years were included. Linkages were made to the Danish National Patient Register for information on adult SLE registrations. During 40 years of follow-up, 435 individuals (366 women) were registered with SLE. Cox proportional hazard regressions were performed to estimate hazard ratios (HR) and 95% confidence intervals (CI).

Results

No differences in any associations were detected between men and women. Childhood BMI and height were positively and linearly associated with SLE risks and the estimates were similar in magnitude across all childhood ages. For BMI at age 7, the HR was 1.11 (95% CI: 1.01-1.23) per z-score. For height at age 7, the HR was 1.13 (95% CI: 1.02-1.24) per z-score. Children who were heavier or taller at 7 and 13 years than average-sized children had a tendency for increased risks of SLE, with a HR of 1.06 (95% CI: 1.00-1.12) and 1.06 (95% CI: 1.00-1.12) per 0.5 z-score change in BMI and height, respectively.

Conclusion

Heavy and tall children have increased risks of adult SLE. These findings reinforce the hypothesis that early life factors are important in SLE aetiology.

Which overweight adults do not realise they are overweight?

Ellen Jo Thompson University College London, UK
David Bann University College London, UK
George Ploubidis University College London, UK
Alice Sullivan University College London, UK

Obesity is high on the health policy agenda, with a focus on healthy eating and activity advice, especially targeted at those who need to lose weight to achieve a healthy Body Mass Index (BMI). But to what extent do overweight and obese individuals correctly identify as such? This paper uses the 1970 British Cohort Study (BCS70) to assess men and women's perceptions of their own weight status in mid-life (age 46). We first assess the extent of the problem of individuals incorrectly assessing their own weight status as healthier than the reality. We then determine what the predictors are of this misperception, including sex, educational qualifications, alternative measures of shape and weight, long-standing vs recent overweight, and area level obesity.

Standardization of foot growth curves for Japanese children aged 18-78 months

K Ueda Minatogawa College, Japan
S Kokudo Minatogawa College, Japan

Introduction

The purposes of this study were to develop a standardized foot growth curve of Japanese children, and to compare the difference from JIS (Japanese Industrial Standard) S5037.

Methods

The foot length (FL) and width (FW) of 5,765 children aged 18-78 months (1.5-6.5 years) were measured in 2013-2019. Measurements were made using a 2D foot scanner (Foot Look). The LMS method (Cole and Green (1992)) was applied to the standardized growth curves (FL, FW, and FW/FL ratio by age, FW by FL) of the 3rd, 10th, 25th, 50th, 75th, 90th and 97th percentiles. The results were compared with the JIS S5037.

Results

The median of FL was 127.0mm (ranged 115.9 (3%ile)-137.2mm (97%ile), the same hereinafter) at 18-month-old. It increased quickly until 36-month-old; the median is 147.0mm (134.0-159.4mm) at 42-month-old. After that, the increment ratio became slow and the distribution range became larger; the median was 179.6mm (163.6-197.4mm) at 78-month-old. The median of FW was 55.3mm (50.0-62.3mm) at 18-month-old. It increased until 42-month-old; the median is 62.7mm (56.3-70.0mm) at 42-month-old. After that, the increment ratio became slow slightly, but the distribution range was almost same during the early childhood. The median was 72.0mm (64.9-79.9mm) at 78-month-old. Children's shoes sizes were regulated based on JIS. The growth curve of foot width on foot length was linear and the distribution ratio was almost same during the period.

Conclusion

JIS might not have been based on experimental data for under 36-month-old: they were determined by extrapolation from the data of 3 to 6-year-old. It means that the children's shoes were produced in Japan is not appropriate Japanese children's foot shape.

Economic crisis, trends in maternal profile and birth outcome in Spain

Carlos Varea Autonomous University of Madrid, Spain
José Manuel Terán Autonomous University of Madrid, Spain
Sol Juárez Stockholm University/ Karolinska Institute, Sweden
Cristina Bernis Autonomous University of Madrid, Spain
Barry Bogin Loughborough University, UK

Introduction

The 2007/2008 economic crisis has had an unequal impact on the health of European populations, worse in those countries which adopted austerity measures and reduced social protection. Countries that implemented more severe austerity measures reported a worsening of birth outcome, analysis suggesting that the economic recession affected perinatal health both by an increase in psycho-social stress and by the deterioration of material conditions. The aim of this communication is to summarize evidences on trends in maternal profile and birth outcome associated with the economic crisis in Spain in a wide time frame, from 1996 to 2016.

Methods

Using data from the National Vital Statistics, descriptive and multivariate analysis was performed in order to describe and evaluate trends in maternal-foetal variables related to single live births born to Spanish mothers, including disparities in birth outcome by parity, maternal age and socioeconomic characteristics.

Results

A general and immediate worsening in birth outcome is described following the outset of the crisis, as well as an increase in disparity among extreme socio-economic groups during the worst years of the recession. Simultaneously, during the economic crisis there was a significant increase in births to both primiparous and multiparous women from more privileged social backgrounds and a substantial reduction of births to housewives. Consequently, LBW stabilised at maximum temporal levels among primiparous mother, decreasing among multiparous ones.

Conclusion

The crisis has determined a clear maternal socio-economic selection, determining the postponement of, or definite decision not to undergo, first-time motherhood among Spanish women.

Linkage accuracy as a source of bias in RCTs using unconsented linkage to administrative school data to assess long-term cognitive outcomes

Maximiliane Verfuerden University College London, UK
Mary Fewtrell University College London, UK
Ruth Gilbert University College London, UK

Introduction

Long-term effects of exposures in early life on outcomes in adulthood are well-recognised but hard to evaluate in randomised controlled trials (RCT) because of attrition. We demonstrate unconsented record-level linkage between 9 dormant RCTs of infant nutrition and the English National Pupil Database (NPD). Educational achievement was used as an indicator of cognitive ability. The RCTs had assigned 3507 babies between 1982 and 2001. Infants were randomised to different types of enriched milk formula or standard formula.

Methods

Our objective was to investigate linkage accuracy. Longitudinal RCT data containing name, date of birth, sex and changes of postcode over time were captured through follow up contacts, and linked to data contained in each yearly school census for children attending state school in England. Deterministic rules and manual review were used by the external linkage service, to generate a rank score of linkage certainty for each candidate pair. Trial participants could have multiple candidate pairs.

Results

3350 participants were linked to 1-3 candidate pupils. Only 1044/3544 (29.5%) pairs matched on all linkage identifiers. We will present results comparing linked and unlinked characteristics in RCT participants according to varying thresholds for linkage certainty. We will also illustrate the impact of the threshold used for determining a link on effect measures for school outcomes, using sensitivity analyses.

Conclusion

Unconsented linkage between extant RCTs and administrative data is a useful method to generate evidence on the long-term efficacy and safety of interventions, but errors due to linkage need to be measured and accounted for in analyses.

Testing assumptions on the links between ovarian steroid concentrations and lifetime fertility with cohort data from Bolivian women

Virginia J Vitzthum Indiana University, USA
Hilde Spielvogel Instituto Boliviano de Biología, Bolivia
Jonathan Thornburg Indiana University, USA

Introduction

It is generally thought that inter-individual variation in ovarian steroid concentrations is correlated with variation in lifetime fertility (the number of live births). However, there have been no empirical tests of this assumption, largely because this would require collecting data over an extended time span. We have conducted such a study, following a cohort of rural women in the Bolivian altiplano for over 15 years.

Methods

In 1996 we began a community-based study (Project REPA) of health and ecology in rural Bolivian agropastoralists. This is a natural fertility population (no use of contraception). Participant's reproductive histories and other data were collected during the 2-year study. Saliva and urine samples were collected for up to 8 sequential menstrual cycles, assayed for progesterone (P4) and tested for hCG (a biomarker of conception). Detected pregnancies were followed until loss (miscarriage) or live birth. Fifteen years later we updated these women's reproductive histories and again collected samples for hormone assays.

Results

We previously found that successful conception and gestation were not adversely affected by relatively lower P4 in these women. Here we evaluate the extent to which P4 concentrations during the most fecund portion of the lifespan predict total lifetime fertility.

Conclusion

Our findings are consistent with the argument that there is no species-wide, or even population-wide, ideal hormone concentration for successful reproduction. Rather, the most salient signal for modulating an individual's reproductive investment is a temporal change in ovarian steroid concentrations rather than the absolute concentration per se

The Generation Victoria (GenV) cohort: Building tomorrow's frameworks for biosocial collaboration

Melissa Wake	Murdoch Children's Research Institute, Australia
Sharon Goldfeld	Royal Children's Hospital, Australia
William Siero	Murdoch Children's Research Institute, Australia
Sarah Davies	Murdoch Children's Research Institute, Australia
Joan Leong	Murdoch Children's Research Institute, Australia
Michael Stringer	Murdoch Children's Research Institute, Australia
Richard Saffery	Murdoch Children's Research Institute, Australia

GenV's vision is to help solve complex issues affecting today's children and tomorrow's adults. It conceptualises an entire Australian state becoming a single platform that enhances the speed, capacity and connectedness of research for children and parents. The GenV 2020 Cohort will be open to the families of all 170,000 babies born in Victoria (population 6 million) over two years throughout 2021-2. At its foundation are consent, use of existing universal data and biospecimens, GenV-specific data collection, and the melding of observational and intervention design. Coupled with geospatial, clinical and linked administrative datasets, we aim for lasting change in the landscape of large scale research. Our 'ePhenome' initiative is charged with developing precise early life phenotypic outcomes (neurodevelopment, cognition, psychosocial functioning, growth and physical characteristics) to support trials, genomics and precision population health at a scale not previously possible, via digital delivery across diverse platforms remotely or in person. On the one hand, these must be ultra-short and engaging; on the other, precise and flexible for multiple later purposes. GenV was launched in December 2017 with philanthropic and state funding. Foundational 2018-19 activities include building the LifeCourse Data Repository, commissioning state-of-the-art biobanking facilities, developing the 2020 Cohort Protocol, and initiating the Solutions Hub as GenV's people, science and translation engine. In this development phase, we welcome input to tailor GenV to maximally advance the study of human biology as it relates to individual and population health across the lifecourse.

Body mass index trajectories in adult patients with type 2 diabetes

Britt Wang Jensen Bispebjerg and Frederiksberg Hospital, Denmark
 Charlotte Watson University of Manchester, UK
 Nophar Geifman University of Manchester, UK
 Jennifer L Baker Bispebjerg and Frederiksberg Hospital, Denmark
 Ellena Badrick University of Manchester, UK
 Andrew G Renehan University of Manchester, UK

Introduction

Previous studies examining associations between adult weight and cancer risk are based on a single measure of body mass index (BMI). In patients with type 2 diabetes (T2D) we aimed to identify subsequent trajectories of BMI development.

Methods

A total of 7,727 cancer-free patients (3,350 women) with incident T2D were identified using primary care records from Salford, UK, from 1995 to 2010. Repeated measurements of BMI, from T2D diagnosis (+/-1y) to 10 years after diagnosis, were included. Sex-specific latent class trajectory models were developed using an 8 step approach.

Results

A linear model with random effects and four classes were identified as being the preferred fit for both men and women. The four classes were “low stable BMI” (women 41.1%, men 44.9%), “high stable BMI” (women 44.7%, men 37.2%), “high slightly decreasing BMI” (women 13.3%, men 17.0%) and “steep decrease in BMI” (women 0.9%; men 0.8%). The latter group was considered as outliers and excluded. At baseline patients in the “low stable BMI” group were older (women: 64.4y, men: 60.5y) than patients in the “high stable BMI” (women: 58.8y; men: 56.2y) and in the “high slightly decreasing BMI” group (women: 56.5y, men: 54.5y) (p for men and women < 0.001). Fewer patients in the “low stable BMI” group used any kind of T2D medication (women: 80%, men: 82.8%) compared with the “high stable BMI” (women: 85.6%, men: 84.5%) and the “high slightly decreasing BMI” group (women: 84.3%, men: 86.4%) (women p < 0.001, men p = 0.06). No differences between the groups were observed in the proportion of ever/ never smokers.

Conclusion

We identified three different BMI trajectories among patients with T2D, which varied in baseline characteristics.

Latent class models for use in a clinical setting using cohort data

Charlotte Watson University of Manchester, UK
Hannah Lennon IARC
Nophar Geifman University of Manchester, UK
Andrew Renehan University of Manchester, UK

Introduction

Life-course approaches to determine risk factor exposure are increasingly favoured over traditional 'once-only' epidemiological determination. One is latent class trajectory modelling (LCTM), which clusters individuals' changes in exposure over time and can be used as a tool for identifying early divergent adverse trajectories. There is increasing use of LCTMs in mainstream epidemiology, but often with poor model description, and an over-reliance on BIC for model selection. Here, we aimed to explore methods in deriving and validating LCTMs from multiple cohorts to ensure that they properly represent observed patterns across different populations.

Methods

We interrogated three cohorts, AARP (N: 321,827), PLCO (N: 147,488) and WHI (N: 151,363), with longitudinal BMI as the exposure and cancer incidence as the endpoint of interest. We extended our previous work (<https://bmjopen.bmj.com/content/8/7/e020683>) to (i) testing multiple start points to obtain the global maximums; (ii) facilitating model choice with alternative metrics to BIC; (iii) developing visual model assessment tools.

Results

We illustrate a number of examples where deviation from model assumptions yield very different classifications. After arriving at preferred models, we show that LCTM improve the performance characteristics of BMI exposure, compared with once only BMI measures, however, this improvement is clinically modest. LCTM might best identify specific sub-populations that have very high risk for cancer incidence.

Conclusion

The study highlights that model selection needs to be undertaken with care and not based solely determined by lowest BIC. We emphasise that multiple start points should be tested when using these models.

Describing change in musculoskeletal aging: a comparison of techniques using data from the Health, Aging and Body Composition Study

Leo Westbury University of Southampton, UK
Holly Syddall University of Southampton, UK
Elaine Dennison University of Southampton, UK
Cyrus Cooper University of Southampton, UK

Introduction

Preventive strategies for musculoskeletal disorders require a better understanding of age-related changes in muscle strength, physical function and body composition (including bone). Many studies use simple change measures from observations at two time-points. Sophisticated techniques for analysing change are available but are rarely implemented in this field.

Methods

Changes in grip strength, gait speed, lean mass and hip bone mineral density (BMD) were explored among 3075 men and women from the Health, Aging and Body Composition Study; each measure was assessed at least 5 times during a median 9 year follow-up period. The following techniques were implemented: linear mixed effects models (LMEM); growth mixture models (GMM); and latent class trajectory models (LCTM).

Results

Mean (SD) age at baseline was 74.1 (2.9) years. Trajectories from LMEM for grip strength, gait speed and hip BMD were quadratic in relation to age such that declines accelerated with advancing age; decline in lean mass was linear. All GMM contained a group comprising at least 80% of the sex-specific sample with sparse numbers of participants in other groups, suggesting that a LMEM with a single population average trajectory describes most of the change in the sample. LCTM derived subgroups with much larger differences in levels of the characteristics rather than in rates of loss.

Conclusion

LMEM enable a more comprehensive analysis of change compared to methods using data from only two time-points. However, inter-individual differences in rates of change regarding musculoskeletal parameters in this age group and duration of follow-up may be too small to be identified using more complex techniques such as GMM or LCTM.