Teaching Materials

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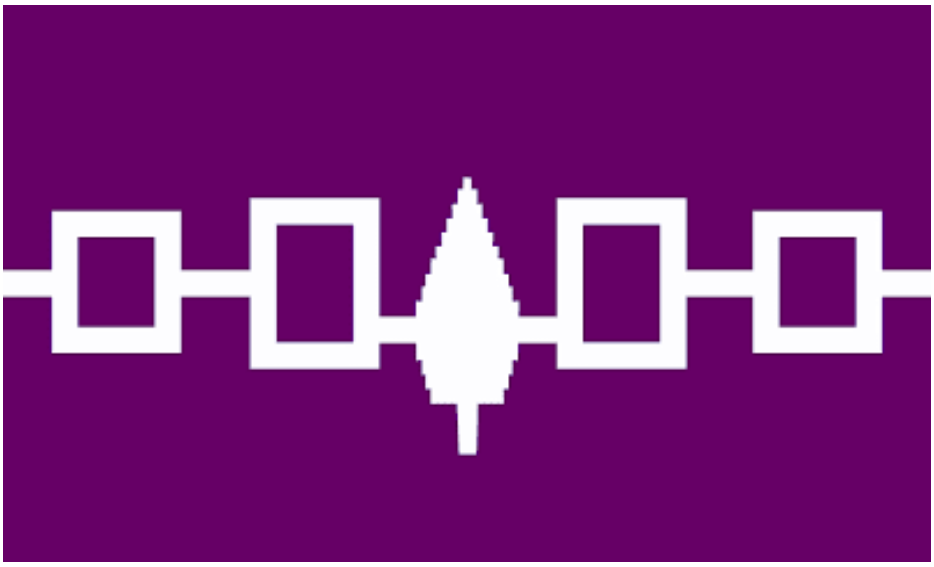
Land Acknowledgement

McMaster University is situated on the traditional territories of the Haudenosaunee and Anishinaabe Peoples, on the lands protected under the Dish with One Spoon Wampum Agreement. In this agreement, the dish represents the land, and the spoon represents the people who are to take only what they need. We take this space to acknowledge the original stewards of this land and thank them for their ongoing efforts to protect Turtle Island.

We encourage you to learn about the lands on which you live and work by visiting whose.land or native-land.ca. If you're within Canada, you can also text 1-855-917-5263 with your location (e.g., Hamilton, Ontario), to identify the lands you occupy.



Flag of the Haudenosaunee and Six Nations, designed by Rick Hill, Harold Johnson, Tim Johnson.

Anishinaabe Thunderbird, by Grand Chief Ben Wawia

Description of the Workshop and Purpose of the Teaching Materials

Adolescence is a key phase of life, marked by drastic biological and social changes. Yet, despite adolescence being such a transformational period of life, we know relatively little about it in past populations; the study of adolescence in biological anthropology has only recently emerged.

Emerging Adolescence was a two-day virtual workshop that placed developments related to adolescence in bioarchaeology at the centre of wider developments initiated by anthropologists working across the social sciences and allied areas. Featuring Canadian and international scholars, the workshop explored the ways in which we can learn more about adolescents, and how the study of adolescence can enhance our study of the past more broadly.

A total of 207 people from 29 countries registered for the two-day workshop, almost half of which were undergraduate and graduate students. This workshop would not have been a success without you, so thank you for taking the time to join us. If you're one of the 116 individuals who have incorporated adolescent research into your work before, we hope the workshop and subsequent materials inspired you to consider new approaches, interpretations, and stories into your understanding of adolescence. If you're one of the 91 individuals who have not yet engaged with this topic, we're excited to see where you take it next.

Video presentations were recorded, and are now available online for viewing, and incorporation into teaching materials.

This document provides key resources for instructors who wish to incorporate the videos and components of adolescence into their course. This includes definitions of key concepts and terms, as a primer for those that are less familiar with the study of adolescence in bioarchaeology, video links and synopses, and discussion questions that could be integrated into larger classes.

Stay tuned for an upcoming special issue with *Bioarchaeology International*, where selected works will be published following peer-review, to continue the conversation and dissemination of the work presented within the context of the workshop.

If you have any questions, please contact the organizing committee at EAVW2021@mcmaster.ca.

Permission to Use Materials

The videos and content within this document are made publicly available for your use and dissemination. We request that, when used, you credit the workshop (*Emerging Adolescence*), and/or the original authors for their research and contributions.

Videos are linked throughout, or the Emerging Adolescence video channel can be accessed at MacVideo.

Key Terms and Concepts

Adolescence is a key phase of life, marked by drastic biological and social changes.

Biologically, adolescence is the time in which individuals achieve their adult height and weight, develop secondary sexual characteristics, and become sexually fertile. Many of the changes during adolescence take place during puberty, a period of rapid growth, characterized by the development of secondary sexual characteristics and the pubertal growth spurt. This process is typically divided into five stages: pre-puberty, acceleration, peak height velocity (PHV), deceleration, and post-puberty. While the pattern of changes is well known, the timing and pace with which an individual goes through these stages is dependent on a wide variety of factors including genetics, diet, disease, and social conditions.

Key terminology in biological aspects:

Puberty. Period of rapid growth, characterized by the development of secondary sexual characteristics and the pubertal growth spurt.

Pubertal Onset. The age at which pubertal changes first take place. An important milestone in the process of puberty.

Pubertal Tempo. The pace at which individuals progress through the process of puberty. An important measure of puberty.

Menarche. The first occurrence of menstruation. Typically occurs one year after PHV.

Socially, adolescence it is recognized as the point at which children become adults, and often includes a change in social position and responsibilities such as the introduction to the workforce or independent living. However, as social age is culturally constructed, the exact definition and experiences will depend on the community, as well as individual identity variables such as sex, gender, and status.

Key terminology in social aspects:

Adolescence. A social age group, often conceptualized as a transitional period between childhood and adulthood. In western contexts, it is often perceived as a "rebellious" stage. However, definitions and experiences vary across space and time.

Adolescent(s). A person or persons within the social age group of "adolescence".

Childhood. A social age group, often conceptualized as physically, mentally, and socially immature. In Western contexts, it is often perceived as a dependent stage. However, growing bioarchaeological research demonstrates that children took on diverse roles and responsibilities within their communities.

Child(ren). A person or persons within the social age group of "childhood".

Non-Adult. Refers to biologically immature or under-developed body. Individuals may also use sub-adult or juvenile.

Adult. May refer to a social age group (e.g., socially mature and independent individuals) or a biological age group (e.g., those whose growth and development are complete).

Annotated Bibliography

Selected readings below may help provide you and/or your students with a better grounding in the bioarchaeology of adolescence. Keep your eyes open for an upcoming special issue of *Bioarchaeology International,* which will also include articles from some of the presenters from the workshop. Articles below are organized by publication date.

Shapland, F., & Lewis, M. E. (2013). Brief communication: A propose osteological method for the estimation of pubertal stage in human skeletal remains. *American Journal of Physical Anthropology 151*(2): 302-310. https://doi.org/10.1002/ajpa.22268.

This seminal piece in the study of adolescence outlines the first of the methods used to evaluate pubertal stage at death. In this brief communication, Shapland and Lewis summarize clinical literature regarding osteological and dental changes in relation to puberty and provides adaptations for use on dry bone. They focus on the (1) mineralization of the mandibular canine root, (2) ossification of the hook of the hamate, development and fusion of the phalangeal epiphyses, (3) ossification of the iliac crest, and (4) fusion of the distal radius. They apply the methods of adolescents from medieval England, finding that they entered puberty around the same time as modern populations, but experienced an extended period of pubertal development.

Shapland, F., & Lewis, M. E. (2014). Brief communication: A proposed method for the assessment of pubertal stage in human skeletal remains using cervical vertebrae maturation. *American Journal of Physical Anthropology 153*(1): 144-153. https://doi.org/10.1002/ajpa.22416.

A following their 2013 publication, Shapland and Lewis expand the methodology related to assessing pubertal timing in skeletal remains, by incorporating cervical vertebrae maturation (CVM). They compare patterns of CVM to previously reported methods for assessing puberty and then apply this to 594 adolescents from medieval England. They conclude that an extended period of pubertal development may be due to negative environmental conditions for growth and development.

Shapland, F., Lewis, M., & Watts, R. (2015). The lives and deaths of young Medieval women: The osteological evidence. *Medieval Archaeology 59*(1): 272-289. https://doi.org/10.1080/00766097.2015.1119392.

In this study, Shapland, Lewis and Watts analysed skeletal remains of 300 medieval female children and young adults aged 14-25 years from medieval English cemetery sites (900-1600 CE), as female individuals of this age category have been historically neglected in historical literature. Osteological assessments found that the adolescent stage, both biologically and socially, was an important life stage for young medieval women. During this time, they reached full adult growth and fertility and adopted adult roles in society. They experience differential susceptibility to disease, especially respiratory infections, and physical duties as a result of their social roles. Overall, this article helps fill in the gaps of understanding of young women during medieval periods using osteological evidence, demonstrating how we can consider their biological and social experiences during adolescence.

Lewis, M. E., & Watts, S. R. (2016). The influence of chronic conditions and the environment on pubertal development. An example from medieval England. *International Journal of Paleopathology 12*: 1-10. https://doi.org/10.1016/j.ijpp.2015.10.004.

Lewis and Watts investigate the impacts that chronic illness has on the duration of puberty in medieval England (900-1550 CE). Chronic disease has been found to affect puberty timing in modern populations but has not been investigated in past populations. Using 607 adolescent skeletons, age, sex, pubertal stage, and pathology assessments were performed. Results found that 22.2% of individuals experienced delay in pubertal stage development. When comparing samples, they found 40.0% of individuals with existing pathology experienced delays, compared to 25.4% of the individuals without observed pathological conditions. Peak height velocity and age at completion were most affected by chronic disease. This study was the first to integrate pubertal stage assessments with pubertal delays as a result of chronic disease. Additionally, it provides insight into the influence of disease on developing adolescents.

Arthur, N. A., Gowland, R. L., & Redfern, R. C. (2016). Coming of age in Roman Britain: Osteological evidence for pubertal timing. *American Journal of Physical Anthropology 159*:698-713. https://doi.org/10.1016/ajpa.22929.

The first validation study related to the pubertal timing methods, Arthur and colleagues investigate pubertal timing in 38 adolescents from Roman Britain (1^{st}-5^{th} centuries CE). They find that adolescents in the Roman Empire began puberty around the same time as modern populations, but completed it later, with menarche occurring 2-4 years later than present-day European females. They identify limitations of the pubertal timing methodology, and areas where

future research may focus to strengthen studies of puberty in the past. Ultimately, they conclude that the pubertal timing methods were successfully applied and have important implications for understanding life in the past.

Lockau, L., Atkinson, S., Mays, S., Prowse, T., George, M., Sperduti, A., Bondioli, L., Wood, C., Ledge, M., & Brickley, M. B. (2019). Vitamin D deficiency and the ancient city: Skeletal evidence across the life course form the Roman period site of Isola Sacra, Italy. *Journal of Anthropological Archaeology 55*: 101069. https://doi.org/10.1016/j.jaa.2019.101069.

In this study, Lockau and colleagues explored the biocultural factors affecting vitamin D deficiency in the Roman period skeletal assemblage from Isola Sacra, Italy (1st-3rd centuries CE). Age assessments and macroscopic vitamin D deficiency feature identification were performed on both non-adult and adult individuals. Results found that the prevalence of skeletal vitamin D deficiency evidence was 7.5% in non-adults and 5.7% in adults. When examining the biocultural evidence, the differences in prevalence can be explained through the critical vitamin D periods in infancy and childhood, as well as the adolescent growth spurt being a time highly susceptible to vitamin D deficiency. Overall, this study indicates that the adolescent period represents a stage of susceptibility to skeletal features of vitamin D deficiency, as it is a time of advanced skeletal growth. It also adds to the understanding of the impacts of vitamin D deficiency across the human life cycle.

Nowell, A., & French, J. C. (2020). Adolescence and innovation in the European Upper Palaeolithic. *Evolutionary Human Sciences 2*(e36): https://doi.org.10.1017/dhs.2020.37.

In this article, Nowell and French illustrate the importance of focusing studies on adolescent populations, as they can provide increased understanding of social, physical and cognitive lifeway components in the Upper Paleolithic (ca. 40-12 kya). Recognizing the limits of the osteological record, Nowell and French propose a model of adolescence using an evolutionary framework, rooted in psychology, ethnography and palaeodemography. They suggest that adolescents played a significant role in the spread of ideas and innovations between groups during the Late Pleistocene period, as they had high mobility. However, this article did not go into depth regarding gendered differences in adolescent roles. This article demonstrates the importance of studying adolescence in order to have a greater understanding of past populations.

Blom, A. A., Schats, R., Hoogland, M. L. P., & Waters-Rist, A. (2020). Coming of age in the Netherlands: An osteological assessment of puberty in a rural Dutch post-medieval community. *American Journal of Physical Anthropology 174*(3), 463-478. https://doi.org/10.1002/ajpa.24161.

Blom and colleagues apply the pubertal stage estimation methods to a rural post-medieval Dutch community (19th century CE), to provide new insights about pubertal development and delay in the recent past. A total of 55 individuals (including 27 known age-at-death and sex) were assessed for skeletal markers of the pubertal growth spurt. Timing of onset appears earlier, while completion appears later than other archaeological skeletal samples. Additionally, age at menarche is estimated to have occurred at 20.45 years of age, much later than other archaeological studies of pubertal timing. The extended period of puberty at this site may be related to hard physical labour or disease exposure in the countryside, as discussed in historical texts. The extended period of biological development found by Blom and colleagues reflects the extended period of social development also experienced during this period, suggesting connections between biological and cultural patterns of development.

DeWitte, S. N. & Lewis, M. (2020). Medieval menarche: Changes in pubertal timing before and after the Black Death. *American Journal of Human Biology 33*(2), e23439. https://doi.org/10.1002/ajhb.23439.

In this study, Dewitte and Lewis explored the differences in pubertal timing in adolescent females from St. Mary Spital, London (1120-1540 CE) before and after the Black Death. The researchers based their hypothesis around the growth and reproduction energetic trade-off, as previous evidence suggests female stature decreased after the Black Death. Osteological pubertal stage assessments were conducted on 74 adolescent female individuals. Results from these assessments found that based off differences in the average age at death of post-menarcheal adolescent females, the average age of menarche increased before the Black Death and decreased after the Black Death epidemic. The increased age of menarche pre-epidemic was likely due to the unfavourable conditions as a result of a 13th century famine and the decreased menarcheal age post-epidemic may be the result of improved diet due to depopulation. These results indicate that adolescent females may have had increased health conditions post-epidemic which allowed for decreased menarcheal age. Though this study does not account for confounding variables, it provides novel skeletal evidence for the relationship between decreased menarcheal age and improved health conditions.

Avery, L. C., Brickley, M. B., Findlay, S., Chapelain de Seréville-Niel, C., & Prowse, T. L. (2021). Child and adolescent diet in Late Roman Gaul: An investigation of incremental dietary stable isotopes in tooth dentine. *International Journal of Osteoarchaeology 31*(6): 1226-1236. https://doi.org/10.1002/oa.3033.

In this paper, Avery and colleagues investigate the diets of children and adolescence from the Late Roman (4th-5th centuries CE) Lisieux-Michelet site in Lisieux, France through the use of stable carbon and nitrogen isotope analysis of incremental dentine sections. Second and third molars from 46 sex-estimated individuals were used in the analysis. Results found that as young

children, diets consisted of minimal animal proteins but as individuals aged, more animal proteins were integrated into diets of both males and females. Additionally, results showed that around 16.5 years of age, sex-specific diets began to appear, as seen through significantly lower nitrogen isotope values in males compared to females. This divergent diet occurs at a transitional social period in the Late Roman life course where men often left home to complete military or work duties as women remained close to home. The use of permanent dentition allowed for accurate sex estimation and gender difference analyses. Through the integration of Childhood Social theory, this study conducted using isotope analysis illustrated the similarities and gender-based differences in childhood and adolescent diets in relation to social age changes during the Late Roman period.

Filipek, K. L., Roberts, C. A., Gowland, R. L., Montgomery, J., & Evans, J. A. (2021). Illness and inclusion: Mobility histories of adolescents with leprosy from Anglo-Scandinavian Norwich (Eastern England). ***International Journal of Osteoarchaeology.*** **https://doi.org/10.1002/oa.3029.**

In this study Filipek and colleagues investigated the social stigma surrounding adolescents with visible signs of leprosy in ab Anglo-Scandinavian parish cemetery in Norwich, UK (10-11th centuries CE). Adolescents were chosen as the focus as they are often representative oof social attitudes towards disease in the past. Macroscopic methods were used to find evidence of leprosy from the original published skeletal report. Radiogenic strontium and stable oxygen isotope analyses were performed on premolar and molar enamel samples to understand the movement of individuals with leprosy. Results showed that, based on normal burial patterns and isotope profiles that were consistent of the Norwich region, the adolescents with leprosy did not experience notable community cemetery exclusion based on social stigmatic factors. Though the sample size used was small, and the young age of the individuals may have reduced the chances for migration outside of the community, this study utilized the first strontium and oxygen isotope data for individuals with leprosy in the region and adds to the research surrounding social stigma and disease.

Video Details and Discussion Questions

Emerging Adolescence in Bioarchaeology: Current Status and Potential Developments

Mary Lewis[1]

[1]University of Reading (UK)

Video Synopsis

In this keynote presentation, Professor Mary Lewis provides an introduction to adolescence, including the hormonal, osteological, and cognitive changes that occur for males and females during this period. She also outlines why we, as biological anthropologists, should be interested in the study of adolescence, and some of the ongoing work by a wide range of researchers. She discusses some of the limitations or methodological issues, as well as possibilities for future studies of adolescence. Ultimately, this talk outlines why we should be interested in the study of adolescence, what type of work is currently happening within the field, and where we might go in the future

Running time: 24 minutes and 59 seconds. Closed captioning available.

Presentation Abstract

Adolescence is a complex and dynamic transitional period of life. It is a contextual and individually tailored experience dependant on the individual's social status, gender, location, culture and family circumstances. Puberty provides a critical window of opportunity for measuring and understanding health before and during adolescence, and its timing and tempo are influenced by both long-term development and immediate circumstances. The study of adolescent skeletal remains bridges the gap between child and adult bioarchaeology but until recently, detailed studies of adolescent skeletal remains have been neglected. This paper highlights the importance of this life stage in our understanding of evolutionary development and generational health in the past. We explore the development of adolescent research in bioarchaeology and use archaeological and historical studies to examine the patterns that are emerging about adolescent experiences in the past.

Discussion Questions

1. Of the various ways biological anthropologists might investigate adolescence, which interests you the most? Why? How can you investigate this?
2. What possibilities and what limitations do you see in the study of adolescence? How might anthropologists overcome these in the future?

Author biography

Mary Lewis is Professor of Bioarchaeology at the University of Reading, UK and a world-renowned expert on childhood bioarchaeology. She specialises in the diagnosis of diseases in children and

adolescents, and amongst her publications are over 17 peer reviewed article, 12 edited chapters, and two books promoting the study of non-adult remains in bioarchaeology: *The Bioarchaeology of Children* (CUP 2007) and *Paleopathology of Children* (Academic Press 2018). Over the past five years, her work on methods enabling researchers to estimate stages of puberty in archaeological skeletal remains have established her as the leading expert on adolescence, opening the door to a more direct analysis of adolescent skeletal remains.

Which comes first? An investigation of pelvic vs. body breadth growth velocity in adolescent girls from the United Kingdom.

Sarah-Louise Decrausaz [+,1,2], Jay T. Stock[1, 3, 4], Jane E. Williams[5], Mary S. Fewtrell[5], Jonathan CK. Wells[5]

[1]Department of Archaeology, University of Cambridge (UK)
[2]Department of Anthropology, University of Victoria (Canada)
[3]Department of Anthropology, Western University (Canada)
[4]Department of Archaeology, Max Planck Centre for the Science of Human History (Germany)
[5]Childhood Nutrition Research Centre, Population, Policy, and Practice Research and Teaching Department, UCL. Great Ormond Street Institute of Child Health (UK)

Video Synopsis

Examining cross-sectional and longitudinal DEXA scans living girls in the UK, Dr. Decrausaz investigates patterns of growth in the pelvis around the time of menarche. She finds that peak growth velocity for the pelvic canal is closely related to the onset of menses, offering bioarchaeologists another way to investigate pubertal timing, and highlighting the importance of biological anthropologists, nutritionists, and clinicians working together.

Running time: 13 minutes and 42 seconds. Closed captioning available.

Presentation Abstract

The growth pattern of the female pelvis is unclear, making it difficult to quantify possible causes for compromised obstetric capacity. The pelvis may be affected by puberty as this growth stage is key for preparation for reproduction. Previous work shows that pelvic breadth growth in girls occurs at a slower rate than growth in height, and that peak growth velocity for pelvic breadth occurs approximately 1 year prior to onset of menses. This study examines growth patterns of pelvic breadth alongside body breadth around the onset of menses. Body composition data and pelvic dimensions were collected from dual energy x-ray absorptiometry (DEXA) scans from 286 girls and women living in London and southeast England today between the ages of 4 and 22 years. Outcome pelvic dimensions collected from DEXA scans were bi-iliac breadth, mediolateral inlet breadth and biacetabular breadth. Outcome body breadth dimensions collected from the same scans were shoulder breadth. Variables were converted to age-adjusted z-scores to enable

accurate comparison between adults and growing children. Growth velocity charts for pelvic breadth and body breadth were created using the LMS method. Average age at menarche in sample was 12.6 years. Peak growth velocity (PV) for shoulder breadth occurred at 8.2 years. There was no clear PV for bi-iliac breadth growth velocity decreases between 10 and 18 years of age. PV for biacetabular breadth occurred at 11.9 years and PV for mediolateral inlet breadth occurred at 12.5 years. These results suggest that growth velocity differs between body breadth and pelvic breadth and that measures of pelvic canal breadth align more closely with age at menarche as a marker of skeletal growth prioritizing for reproduction.

Discussion Questions

1. Dr. Decrausaz uses cross sectional and longitudinal data. What are the benefits of using these two approaches? Is one better than the other?
2. This study is based on the analysis of females, but data exists for similar studies to be conducted focused on male patterns of growth and development. Considering biological differences between males and females (e.g., menses, reproductive functions), do you expect males to exhibit a similar pattern? Why or why not?

Author biography

Dr. Sarah-Louise Decrausaz is an emerging scholar, graduating from the University of Cambridge, UK (2019). She has taught courses on human evolution, the human skeleton, and maternal health, which included modules on biological and social health during adolescence. Dr. Decrausaz's research focuses on using modern data on pelvic growth and development to inform our understanding of past communities. Her presentation at this workshop highlights the ways in which the female body changes during the period of adolescence, and how biological anthropologists may use modern populations to inform our understanding past populations. In addition to her teaching and research, Dr. Decrausaz is a writer and presenter for "Humans in 5", a weekly web series profiling anthropological research, demonstrating new methods of research delivery and innovative approaches to training.

Is Adulthood Required? Examining the Accuracy of Pelvic Sex Assessment Throughout Pubertal Growth.

Jose Sanchez[+,1] & Rob Hoppa[1]

[1]University of Manitoba, Canada

Video Synopsis

Identifying biological sex for non-adult skeletons is problematic. To address this, Dr. Sanchez investigates the relationship between pubertal stage and accurate sex estimations based on morphological pelvic traits. While specific traits vary, he concludes that post-puberty is not

always necessary for the full manifestation of biological sex, encouraging researchers to incorporate pubertal stage analysis when conducting sex estimations for younger individuals.

Running time: 12 minutes and 32 seconds. Closed captioning available.

Presentation Abstract

Reliable skeletal sex assessment in non-adult skeletons continues to be the most elusive problem in juvenile osteology. While the main focus of methodological exploration has centered on children, less attention has been given to adolescents. An oft-cited challenge to non-adult sex assessment is that full expression of skeletal dimorphism in areas such as the pelvis and skull occurs in adulthood once growth has finished. The aim of this study is to examine the relationship between sexual dimorphism in the pelvis and the stages of pubertal growth. A total of 98 adolescent individuals from the Hamann-Todd and Terry collections were used for pubertal stage assessment and to assess the accuracy of 18 morphological pelvic traits commonly used for skeletal sex assessment. This study suggests that the post-pubertal period is not necessarily required for the full expression of sexual dimorphism of all 18 morphological pelvic traits. Surpassing peak height velocity appears to be more critical given that substantial dimorphism (i.e., 80%+ accuracy) is observed in some traits and overall sex estimates by the deceleration stage. With the growing body of literature on adolescence and pubertal growth in bioarchaeology, a comprehensive and refined understanding of sexual dimorphism in adolescent skeletons can only strengthen interpretations on the nuanced differences of this important life stage between the sexes.

Discussion Questions

1. Dr. Sanchez uses an 80% threshold to evaluate whether or not a morphological trait is accurate. Is this a good standard and appropriate threshold? Why or why not?
2. Will researchers start incorporating biological sex into studies of adolescence (and/or children)? If no, what other barriers exist? If yes, why do we need (or want) to incorporate younger individuals into sex estimations?

Author biography

Dr. Jose Sanchez graduated from the University of Manitoba during the COVID-19 pandemic, under the supervision of Dr. Robert Hoppa. His doctoral research examines the timing at which sex differences in the human pelvis appear in males and females between the ages of 4 months and 20 years. He also co-taught a course entitled "Juvenile Osteology and Bioarchaeology" at Brandon University. As reliable sex-estimations in sub-adult remains is considered the "holy grail" within bioarchaeology, Sanchez's presentation covers a foundational topic, bringing in new ideas and possibilities for overcoming past limitations. This presentation will also help researchers refine reconstructions of the transition into adulthood to better consider nuanced differences between the sexes.

Mobility and Adolescence in Neolithic France, Roquemissou.

Jeffrey Coffin[+1], Alexis Dolphin[1], M Jackes[1], C Yakymchuk[2], T Perrin[3]

[1] Department of Anthropology, University of Waterloo (Canada)
[2]Department of Earth and Environmental Sciences, University of Waterloo (Canada)
[3]CNRS, Université Toulous Jean-Jaurès (France)

Video Synopsis

Jeffrey Coffin and colleagues examine third molars from a neolithic burial site in France, to explore mobility patterns during the development of the third molar (approximately 9-13 years of age). They find considerable diversity in absolute values and patterns of change, suggesting that mobility patterns varied greatly during adolescence. Ultimately, these result demonstrate that adolescence in the neolithic was a period of social age, characterized by specialization of tasks, and the slow adoption to adult roles.

Running time: 8 minutes and 53 seconds. Closed captioning available.

Presentation Abstract

This study uses Laser Ablation-Multicollector-Inductively Coupled Plasma-Mass Spectrometry (LA-MC-ICP-MS) to measure changing 87Sr/86Sr ratios across the growth bands of six third molars (M3s) belonging to individuals from a communal burial located at Roquemissou, in the Aveyron department of Southern France, and dated to the Late Neolithic. The Late Neolithic in this region of France is associated with an increased focus on agriculture and seasonally mobile animal herding (Herrscher et al. 2013). We employ incremental isotopic analyses of tooth enamel from individuals buried at Roquemissou in order to answer questions about the possible relationship between mobility and sedentism in relation to subsistence practices during this period. Third molars were chosen because they develop during late childhood and early adolescence, which recent funerary and isotopic evidence have identified as transitional phases of life in the Late Neolithic (Le Roy et al. 2018; Rey et al. 2021), whereby individuals were likely beginning to take a much more active role in hunting, herding, and farming. This research explores temporal variation in 87Sr/86Sr ratios to document variability in mobility during these proposed transitional phases. Changing strontium ratios and the overall average ranges vary significantly among these six individuals. Some exhibit relatively little change over time, while others shift very gradually, suggesting that these people were not seasonally mobile, and when they did move across the landscape did so very slowly. These findings indicate variability in mobility during adolescence in the region surrounding the site of Roquemissou and serve as a reminder that transitional phases of life may have been experienced differently, and that homogenizing perspectives on adolescence during the Neolithic in France should be questioned.

Discussion Questions

1. Why would some adolescents be moving across the landscape during this period? What activities might they be participating in, and how could we investigate that moving forward?

2. The samples from this study were taken from burial shelters associated with a Late Neolithic village layer. What additional challenges does a burial shelter site (with comingled and disturbed remains) present? What unique opportunities are present?

Author biography

Jeffrey Coffin is a recent Master of Arts graduate from the University of Waterloo's Public Issues in Anthropology program, and currently the Manager of the Ancient and Contemporary Environmental Bioindicators Laboratory (ACEBioLab) at the University of Waterloo. His research with Dr. Alexis Dolphin (Assistant Professor, Director of ACEBioLab - Department of Anthropology) focused on reconstructing the mobility of individuals buried in France during the Neolithic (approximately 3200 BC) using isotopic analysis. He examined changes in the ratio of $^{87}Sr/^{86}Sr$ across the growth bands of maxillary third molars to identify patterns of mobility during the years of adolescence. This research into the lifeways of individuals during adolescence adds to the growing body of research on adolescence as a transitional period of life in the French region during the Neolithic.

Baseline Models for Reconstructing the Lived Lives of Adolescents in the Gravettian

April Nowell [1], Jennifer French[2]

[1]University of Victoria (Canada)
[2]University of Liverpool (UK)

Video Synopsis

Drs. Nowell and French seek to understand adolescence in the Middle Upper Paleolithic (35-25 kya), first by looking to extant hunter-gatherer groups, to create a model of social perceptions and expectations of adolescence. They then apply this model to the Paleolithic, incorporating bioarchaeological and mortuary datasets. They conclude that in the Paleolithic, adolescence was a period of transition, but also a unique stage unto itself, where young people could try on adult roles without serious consequences, while remaining valued members of their communities.

Running time: 19 minutes and 33 seconds. Closed captioning available.

Presentation Abstract

While adolescence is a human universal, the widely documented variation in the experience and role of adolescence in human societies means that no equivalent principle of uniformitarianism can be cited to create a baseline for social or cultural adolescence in the Upper Paleolithic (40,000-10,000 BP). The best recent analogues for the experience and social perception of adolescence in the European Upper Paleolithic, and for the roles and responsibilities of adolescents, are other non-industrial societies, particularly extant hunter-gatherer groups. We need to be careful when making such comparisons to avoid both replicating the present in the

past and implying that these groups are anything other than present-day populations with their own unique histories and cultures. Nonetheless, even at the level of a superficial comparison, data from non-industrial societies are an automatic antidote to all-too-common assumptions that key stereotypes of Western adolescence (e.g., the "teenage rebel") are universal. In this paper, we review key features of social adolescence among extant hunter-gatherer populations which also characterize Upper Paleolithic hunter-gatherers such as the small size of their foraging communities, their low population density, and (largely) mobile lifestyle. We then explore the influence of these variables on the experience and roles of adolescents. Finally, we combine this data with bioarchaeological data to reconstruct the lived experience of at least some adolescents in the European Gravettian (ca. 28,000-21,000 BP).

Discussion Questions

1. Create a model of adolescence based on your own experiences; how would biological anthropologists investigate this in the past? What might biological anthropologists see? What might they miss? How does this compare to the model created by Drs. Nowell and French?
2. Without any idea what adolescence in the paleolithic looked like, Drs. Nowell and French looked to extant hunter-gatherer populations to help create a model of adolescence. Why did they choose this group? What are some of benefits of this approach? What are some of the limitations of this approach?

Author biography

Dr. April Nowell is a professor and chair of the Department of Anthropology at University of Victoria. As a paleolithic archaeologist, her research focuses on Neandertal lifeways, the archaeology of children, and the history of archaeological theory. Her research projects include examining children and communities of practice in the Upper Paleolithic, and social and cognitive development from childhood and adolescence in Neandertal children. In this presentation, Dr. Nowell pushes the boundaries of time, to consider far off populations, and how we can use multiple lines of evidence to better understand those who came before us.

Becoming Adults: An investigation of dietary change in childhood, adolescence, and adulthood at *Isola Sacra* (Italy, 1st-4th centuries CE)

L. Creighton Avery*[1], Megan B. Brickley[1], Luca Bondioli[2], Tracy Prowse[1]

[1]McMaster University (Canada)
[2]Bioarchaeology service, Museum of Civilizations (Italy)

Video Synopsis

In "Becoming Adults", Avery and colleagues use stable isotope analysis of incremental dentine sections to explore dietary change in adolescence at Isola Sacra (Italy, 1-4th century CE). She finds

that elevated nitrogen values between the ages of 10 and 16 might be due to low protein consumption coupled with physiological stress due to pubertal development, stressing the importance of considering social and biological experiences of adolescence in tandem.

Running time: 13 minutes and 1 second. Closed captioning available.

Presentation Abstract

Previous research at the Roman Imperial necropolis of Isola Sacra (Italy, 1-4th centuries CE) points to different diets for males and females, as well as between children and adults. However, to date, research has not been able to identify when this transition occurred, or when gendered diets, as seen in adults, first appeared within the Roman life course. Using dietary stable isotope analysis of incremental tooth dentine, and oblique sectioning protocols, we aim to better understand the transitions between a child and adult diet, as well as works to identify when sex-specific diets began at the necropolis of Isola Sacra (1-4th centuries CE, Italy). Spearman's correlation indicates a positive correlation between age and $\delta^{15}N$ isotope values, suggesting a gradual transition to an 'adult' diet, based on increased consumption of marine resources or higher trophic level foods (r_s=0.541, p<.001). The impact of physiological stress on $\delta^{15}N$ values is also considered within the context of puberty. Incorporating osteological sex estimations, the data suggest that males and females consumed different diets as early as 4.5 years of age, challenging literary sources and previous bioarchaeological research.

Discussion Questions

1. Creighton uses stable isotopes, which tell us about carbon and nitrogen components of diet. What are some limits of this approach, and how could we address those limits moving forward? (Think: what aspects or features of diet are not going to be captured when only using this method).
2. Creighton's conclusions challenge ancient literary sources representations of diet, particularly sex-based diets in childhood. After watching the video, do you believe the literary sources or the isotopic data? Defend your position.

Author biography

Creighton Avery is a doctoral candidate at McMaster University, investigating adolescence in the Roman Empire (1st-5th centuries CE), specifically as it relates to physical and social aging. Her research is supported by her doctoral advisors, Dr. Megan Brickley (Professor, CRC (Tied 1) Bioarchaeology of Human Disease) and Dr. Tracy Prowse (Associate Professor, Associate Dean Academic - Faculty of Social Science). Creighton developed and taught an undergraduate course on Childhood in the Past, which incorporated adolescents into class discussions and student research projects and was a guest lecturer for the Society of the Study of Childhood in the Past. Her presentation is an important contribution for bridging the social and physical changes seen in the skeleton, to consider the experiences of adolescence in a holistic manner.

An Absent Adolescence? A Bioarchaeological Approach to Understanding the Teenaged Lived Experience in 18th Century Atlantic Canada.

Amy Scott[1], Sarah MacInnes[2], Nicole Hughes[1], Vaughan Grimes[3], Jess Munkittrick[3]

[1]University of New Brunswick (Canada)
[2]Parks Canada, Fortress of Louisbourg National Historic Site (Canada)
[3]Memorial University (Canada)

Video Synopsis

In her presentation, Dr. Amy Scott investigates adolescents at the 18th century Fortress of Louisbourgh, to see if their lived experiences were similar to that of adults. Incorporating historical records, as well as mortuary, macroscopic, and isotopic data, she concludes that these teenagers were likely employed as soldiers at the fort, which had detrimental impacts to their health and well-being.

Running time: 13 minutes and 3 seconds. Closed captioning available.

Presentation Abstract

For this study, we will focus on a small subsample of adolescent individuals (12-20 years) from the 18th century Fortress of Louisbourg in Cape Breton, NS looking specifically at patterns of stress, diet, and migration. Despite being physiologically immature, culturally these teenagers at Louisbourg were expected to participate in adult activities, namely military work as soldiers. The pressures of colonial survival and the desperate need to maintain the population of New France provided unique challenges to these individuals, demonstratively shaping their lived experiences.

Discussion Questions

1. The adolescents examined in this study are deceased and did not survive the period of adolescence. Can examination of their remains really tell us about life as an adolescent at the Fortress of Louisbourgh, or does it just tell us about death at the fort?
2. Dr. Scott uses a number of lines of evidence to learn about adolescent experiences at this fort. If she was missing one of these lines (e.g., historical records, or isotopic data), would she be able to come to the same conclusions? Why or why not?

Author biography

Dr. Amy Scott is a bioarchaeologist focused on the lived experience in 18th century Atlantic Canada. Her research specialties include childhood stress, fetal identity and personhood, patterns of non-adult growth and development, mortuary archaeology, and the study of ancient proteins to assess chemical and molecular biology of past peoples. Dr. Scott has published on the theoretical and methodological challenges of stress analysis in non-adult individuals and has published the edited volume, *The Anthropology of the Fetus: Biology, Culture, and Society*. This presentation will provide significant insight into the childhood lived experience at the Fortress of Louisbourg, contributing to the public dissemination of knowledge at this National Historic Site of Canada while also expanding bioarchaeological research in this region.

Adolescent Life in the 18th and 19th century Netherlands.

Andrea Waters-Rist[1]

[1]Western University (Canada)

Video Synopsis

Dr. Waters-Rist looks at historical and archival documents from the post-medieval period Netherlands to learn about adolescence in rural Middenbeemster. She then compares these expected experiences to lived experiences captured in skeletal remains, reporting on pubertal timing, dietary change, mobility and potential ways we may investigate adolescence moving forward.

Running time: 17 minutes and 43 seconds. Closed captioning available.

Presentation Abstract

Dr. Waters-Rist will present historical information about adolescence in the post-Medieval period in the Netherlands, including societal norms about schooling and work inside and outside the home. Many adolescents from a rural 19th century cemetery called Middenbeemster have been identified using archival and municipal documents. Osteological and isotopic research on the individuals of known age, sex, and family are used to reconstruct detailed life course information. A focus is societal norms of marriage and reproduction in the older adolescent/young adult (~18 to 25 years) females with consideration of how pregnancy, birth, and infant feeding might cause changes in the skeleton.

Discussion Questions

1. If we have archival records from a time period that tell us a bit about adolescence, why do we also need to examine skeletal remains? What benefits or drawbacks of there when working with both lines of evidence?
2. Dr. Waters-Rist looks at archival and medical records to investigate what adolescents might be doing and proposes bioarchaeological ways we might be able to investigate these behaviours at Middenbeemster. Look at archival records from your own life (e.g., Facebook, Tik Tok, family photo albums, etc.), what features/behaviours/experiences do these sources say about your adolescence? How might bioarchaeologists be able to investigate that one day? What aspects of your adolescence would bioarchaeologists miss?

Author biography

Andrea Waters-Rist is an Associate Professor at Western University, Canada, and an Adjunct Research Professor at Leiden University, The Netherlands. Her research focus includes dietary analysis, growth and development, paleopathology, and activity-induced modifications. Dr. Waters-Rist's areas of interest include post-Medieval Dutch rural and urban populations, Neolithic to Iron Age Siberian hunter-gatherers and pastoralists, and pre-Columbian Nicaraguan

agriculturalists. This presentation will be unique insights into life course changes for individuals in post-Medieval Netherlands, incorporating bioarchaeological and archival datasets.

Evaluating the Social and Cultural Implications of Adolescent Rickets in the Netherlands in the 19th Century.

Madeleine Lamer*[1], Barbara Veselka[2], Menno LP Hoogland[3], Megan B. Brickley[1],

[1]McMaster University (Canada)
[2]Vrije Universiteit Brussel (Belgium)
[3]University of Leiden (Netherlands)

Video Synopsis

Madeleine Lamer and colleagues investigate manifestations of vitamin D deficiencies during adolescence, by comparing angulation of the sacrum to episodes of interglobular dentine (IGD). Based on the timing of the IGD, she finds that angulation of the sacrum likely represents vitamin D deficiencies in later adolescence, offering a non-destructive approach to investigating health conditions in adolescent individuals. In the context of early modern Netherlands, she suggests that these patterns may be the result of changing social roles or compounded affects of other poor health outcomes.

Running time: 14 minutes and 25 seconds. Closed captioning available.

Presentation Abstract

Vitamin D deficiency is typically the result of combined biological and cultural variables that limit an individual's exposure to sunlight. During growth spurts, such as the adolescent or pubertal growth spurt, high demand for vitamin D puts individuals at an increased risk for developing conditions such as rickets. While bioarchaeologists have investigated childhood rickets, this research is the first to thoroughly investigate rickets occurring during adolescence. Using macroscopic and metric analysis of skeletal remains from the 18th to 19th century Dutch sites of Middenbeemster (*n*=150) and Hattem (*n*=49), and the thin section of seven molars from five individuals from Hattem, we evaluate the paleopathological prevalence and appearance of rickets during the pubertal growth spurt. By identifying rickets, this research also provides a window to view the changing roles of individuals as they begin to occupy new spaces in their transition from children into adults, thus providing a novel way to investigate the lives of adolescents.

Discussion Questions

1. Pathological conditions are often represented in terms of sub-adult (e.g., rickets) and adult (e.g., osteomalacia) manifestations. Why is it important to investigate and consider manifestations of adolescent conditions (e.g., adolescent rickets)? How will this help the study of adolescence, or life more broadly, for bioarchaeologists?

2. Madeleine uses macroscopic and metric methods (taking measurements of the sacrum) and thin sections of teeth (IGD). What are the benefits of these different approaches (e.g., destructive methods, quantitative or qualitative data)? What are the potential drawbacks?

Author biography

Madeleine Lamer is a former Master's student at McMaster University, where she developed methods for the identification of rickets in adolescents and investigating the social implications of adolescent rickets in two Dutch 19th century archaeological sites. With the support of her former advisor, Dr. Megan Brickley (Professor, CRC (Tier 1) Bioarchaeology of Human Disease), she is currently working on publishing aspects of this work. Madeleine has a long-standing interest in adolescence and previously co-organized and co-chaired a session at the 2019 American Association of Anthropology meeting focusing on the embodiment of adolescence and stress "Growing up in times of stress: factors influencing the embodiment of struggle in childhood". Madeleine's presentation provides novel means for studying the changing social roles of adolescents by examining pathological changes in the human skeleton.

Pubertal Timing as a Measure of Health and a Bridge Between Past and Present.

Sharon DeWitte[1], Allison Ham[1]

[1]University of South Carolina (USA)

Video Synopsis

In the closing talk, Dr. Sharon DeWitte explores many of the factors that influence pubertal timing and how bioarchaeologists can use these methods to learn about health and environmental conditions in the past. They also provide a summary of existing studies and their key findings, integrating bioarchaeological data from diverse temporal and geographical contexts. Lastly, Dr. DeWitte highlights the ways in which bioarchaeological studies of pubertal timing are beneficial for the study of life today, suggesting that these studies focus on a previously untapped source of evidence regarding health, social age, and perceptions of the life course.

Running time: 31 minutes and 28 seconds. Closed captioning available.

Presentation Abstract

Bioarchaeologists face major limitations when attempting to reconstruct health and well-being in the past, including heterogeneous frailty, selective mortality, and the generally low specificity and sensitivity of skeletal stress markers. There is a need to expand the toolkit of informative skeletal markers available to bioarchaeologists to improve our studies of these phenomena in the past. Promising variables, to that end, are those that are indicative of pubertal timing. Menarche, for example, is a reliable indicator of standards of living and growth conditions.

Because pubertal timing can be assessed skeletally, bioarchaeological analysis of puberty has the potential to put our research into greater overlap with that of human biologists and economists. That is, by studying something that is assessed routinely in living populations (which is not the case with many skeletal markers conventionally used by bioarchaeologists, e.g. periosteal new bone formation and cribra orbitalia), we can make gains in connecting the patterns we find in skeletal assemblages to those observed in historical data and among living people and engage in fruitful dialogue with scholars in other fields. Further, the use of menarcheal timing, in particular, inherently centers bodies capable of menstruating (often, arguably too simply, referred to as "females") in studies of and conceptualizations of the past, thus avoiding engaging in cis-male-centered bioarchaeological research and bringing our work into better alignment with feminist approaches to the past. This paper describes the use of menarcheal timing to evaluate conditions in the past, in general, and provides case studies from the published literature.

Discussion Questions

1. Dr. DeWitte stresses that bioarchaeological studies of the past can provide unique insights into life today, but collaboration with disciplines beyond biological anthropology is limited. Why is this, and how might we overcome this divide in the future? What do bioarchaeologists need to do?
2. Puberty and menarcheal timing are influenced by so many factors. How do we, as biological anthropologists, account for this? Can we control for them? Should we?

Author biography

Sharon DeWitte is a world renowned paleodemographer and paleoepidemiologist, analyzing infectious diseases in the past, particularly as it relates to how factors such as sex, gender, social status, health, developmental stress, nutritional status, and geographic origin affected risks of mortality from such diseases. For over 15 years, her research has primarily focused on trends in health and demography before, during, and after the 14th-century Black Death in England, producing some of the most cited work on these subjects. She is particularly interested in expanding the tools available to bioarchaeologists to examine health in the past in ways that put us in dialogue with human biologists studying living people, and to that end has recently collaborated on a study of pubertal timing in the context of medieval plague.

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