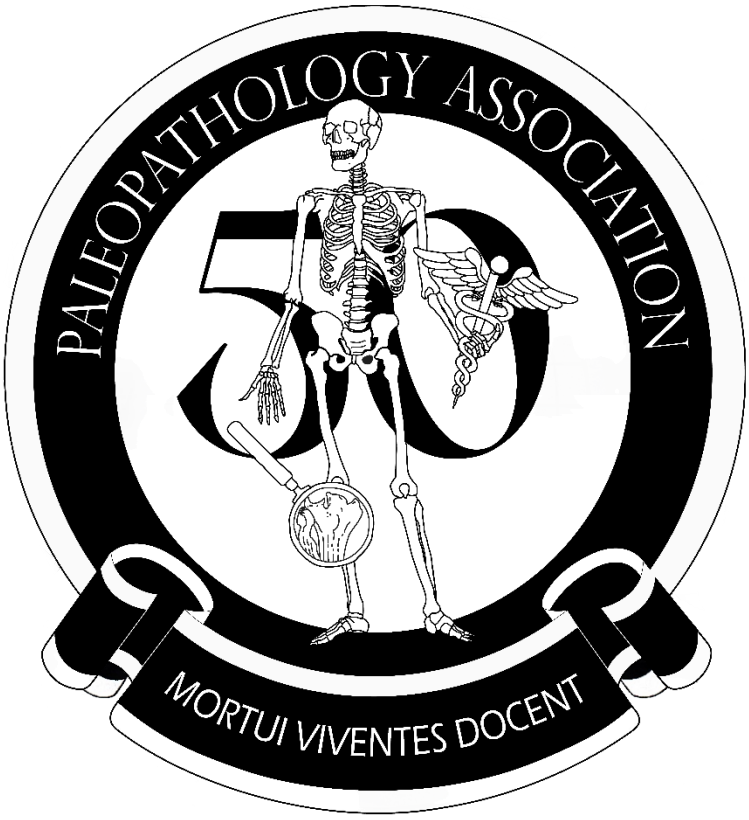

PALEOPATHOLOGY ASSOCIATION

SCIENTIFIC PROGRAM

HYBRID

51st Annual North American Meeting

J.W. Marriott LA Live, 900 W Olympic Blvd, Los Angeles, CA

March 18-20, 2024

PROGRAM NOTES

51st Annual North American Meeting of the Paleopathology Association

March 18-20, 2024

(all times PDT)

Time (PDT)	Session
Monday, March 18	
5:00 pm – 7:00 pm	Registration
Tuesday, March 19	
8:00 am – 10:45 am	Workshop (Dental histology)
10:45 am – 11:15 am	Coffee Break
11:15 am – 11:45 am	Virtual Poster Presentations
11:45 am – 1:15 pm	Lunch Break (Let's Do Lunch for Mentors and Mentees– El Cholo Restaurant)
1:15 pm – 1:45 pm	50th Anniversary Plenary Lecture (Anne Grauer)
1:45 pm – 3:30 pm	In-Person Podium Presentations
3:30 pm – 4:15 pm	Coffee Break and In-Person Poster Presentations (Including the Costs of Migration Poster Symposium)
4:15 pm – 6:00 pm	In-Person Podium Presentations
6:00 pm – 6:30 pm	Break
6:30 pm – 8:00 pm	50th Anniversary Reception and Buffet
Wednesday, March 20	
8:00 am – 9:45 am	In-Person and Virtual Podium Presentations
9:45 am – 10:30 am	Coffee Break and In-Person Poster Session
10:30 am – 12:00 pm	In-Person Podium Presentations
12:00 pm – 1:00 pm	Lunch Break
1:00 pm – 3:00 pm	In-Person Symposium: 21st Century Paleopathology I
3:00 pm – 3:30 pm	Coffee Break
3:30 pm – 5:15 pm	In-Person Symposium: 21st Century Paleopathology II
5:15 pm – 5:30 pm	Break
5:30 pm – 6:15 pm	Awards and Closing

PROGRAM NOTES

Symposia, all podium (virtual and in-person) and all virtual poster presentations: All these presentations can be listened to in our meeting room at the J.W. Marriott Hotel in Los Angeles, CA, and are provided as a virtual element at a location of your choice.

Dental Histology Workshop (Tuesday morning): Please note that the dental histology workshop on Tuesday morning requires participant registration for both virtual and in-person attendees due to space limitations: https://forms.gle/EoK7t8HDj7N2aPJx5

In-Person Poster Presentations: These sessions will take place during the coffee breaks and will **not** be available to the virtual audience. However, the presenters have been asked to put their poster on our virtual poster platform along with a brief presentation prior to the conference so they can be seen by the virtual participants as well.

Virtual Poster Presentations: The virtual poster sessions will require both virtual and in-person attendees to access the virtual poster platform to engage directly with the presenters. The presenters have been asked to put their poster on our virtual poster platform along with a brief presentation prior to the conference so that they may be viewed before interacting with the presenters online.

Let's Do Lunch: For those of you participating in-person we will have lunch on the 18th of April at El Cholo, 1037 S. Flower Street, Los Angeles. https://www.elcholo.com/loscations.html

Let's Do Lunch pairs students with more senior members for lunch, providing students an opportunity to meet a palaeopathology professional and ask questions relevant to their research and professional development. Pairing people at random gives students a chance to meet professionals who they might not otherwise have a chance to have a meaningful discussion at the meeting. The regular member is asked to "treat" the student member by buying them lunch. While regular members will be paired with a single student, the venue will seat multiple pairs together, so there will be opportunities for students to chat with more than one professional. To register for Let's do Lunch use the following link: https://paleopathology-association.wildapricot.org/event-5609174

Meet-a-Mentor: For those of you participating virtually and in-person, regular members and students will be partnered and each pairing will arrange a 1-hour chat at a time convenient to them, ideally during conference week or the week following. This will occur both virtually and in-person depending on the preference of the participants. This provides students (and regular members) who are participating virtually to still have the opportunity to participate in this mentorship exercise. Please register by using the following link: https://paleopathology-association.wildapricot.org/event-5609348. Participants should expect an email with mentor partnering information from our Director-at-Large (Student Liaison), Sian Halcrow (sian.halcrow@otago.ac.nz) during the week prior to the meetings.

COVID-19 safety policies: To minimize the risk of Covid-19 infections during our meeting, please attend the conference online if you feel unwell. We want to ask participants attending in person to wear a mask if possible, and please be mindful of the variety of comfort levels with physical proximity. Ask colleagues before reaching out for a handshake or hug, and please pay attention to body language. Take a few steps back if someone looks uncomfortable. We would ask all participants to be conscientious and aware of the risk for vulnerable members of our community.

SCIENTIFIC PROGRAM

MONDAY, March 18

5:00 pm – 7:00 pm **REGISTRATION** ***Plaza I-III Foyer***

TUESDAY, March 19

7:45 am – 5:00 pm **REGISTRATION** ***Plaza I-III Foyer***

8:00 am – 10:45 am **WORKSHOP: Dental Histology Disclosed: how to explore life-histories through analysis of dental tissues and mircrostructures** ***Plaza II***
LED BY*:* Anne Marie SOHLER-SNODDY, Marie WEALE, Chris ARIS, Barbara VESELKA, Lucy KAVALE-HENDERSON

10:45 am – 11:15 am **COFFEE BREAK** ***Diamond***

11:15 am – 11:30 am **VIRTUAL POSTER PRESENTATIONS I** ***Virtual***

A possible case of crucifixion from Roman-period Fenstation, Cambridgeshire, England.
Francesco M. GALASSI, Elena VAROTTO, Corinne DUHIG

Unveiling ancient afflictions: traumatic pathology in the skeletal remains of Barcelona's laity buried at the Santa Caterina friary archaeological site in Barcelona (13th- early 16th centuries).
Antony CEVALLOS, Carme RISSECH, Xavier TOMÀS, Alexandre TARRAGÒ, Jordi NADAL, Lluís LLOVERAS

An archaeoparasitology study from southwestern China: first-ever-attempted case study from a Bronze-Age Yunnan site (17th – 3rd Century BCE).
Xiaoya ZHAN, Dong-Yue ZHAO, Ranchao ZHOU, Hui-Yuan YEH ***

External auditory exostosis: exploring environmental factors and prevalence in ancient southern South American populations. ++
Cynthia Daniela PANDIANI, Paula NOVELLINO, Gabriela DA PEÑA ALDAO, Daniela GUEVARA, Jorge SUBY

Demonstration of the existence of spinal tuberculosis in ancient Sicily (ca. 7th-5th centuries BCE): the first morpho-radiological evidence.
Claudia FIORENTINO, Elena VAROTTO, Francesco Maria GALASSI, Luca SINEO

An overview of blast trauma in World War I soldiers from selected cases of the Italian front.
Daniel GAUDIO

11:30 am – 11:45 am **VIRTUAL POSTER PRESENTATIONS II** ***Virtual***

A comprehensive literature review of Pectus Excavatum.
Leon CORNEILLE-COWELL, Francesco Maria GALASSI, Elena VAROTTO, Paola PONCE ***

Bipartite patella and vastus notch: an examination of prevalence and etiological factors in late Holocene human skeletons from southern Patagonia, Argentina.
Rodrigo ZUÑIGA-THAYER, Gustavo FLENSBORG, Jorge Alejandro SUBY

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++ International Journal of Paleopathology Early Career Conference Award Prize Entrant

Caring for their teeth: dental health in nonadults from two Roman Imperial age communities from Italy.
Federica GUERRA, Vittoria BIANCHI, Alessandra SPERDUTI

Lethal congenital defects: different expressions of anencephaly in infants from S. Domingos necropolis, Lisbon (17th-19th century).
Marina LOURENÇO, Francisco CURATE, Eugénia CUNHA ***

Osteoarthrosis in Mendoza, Argentina, during the late Holocene: anatomical specificity and links to economic changes.
Daniela GUEVARA, Jorge SUBY, Paula NOVELLINO

The association between osteoarthrosis and osteoporosis in the Coimbra Identified Skeletal Collection (late 19th – early 20th centuries).
Francisco CURATE, Sara SILVA, Ana Maria SILVA

Multiple osteochondromas in a Qing period individual from Shandong, China.
Yawei ZHOU, Fanhao XI, Elizabeth BERGER, Yanmei LIU

11:45 am – 1:15 pm LUNCH BREAK

1:15 pm – 1:45 pm PLENARY LECTURE ***Plaza I-II***

Celebrating our 50th anniversary: why looking back is a great way forward
Anne L. GRAUER

1:45 pm – 3:30 pm IN-PERSON PODIUM PRESENTATIONS ***Plaza I-II***
CHAIR: Derek BOYD and Hannah KOON

1:45 Thinking out of the casebook. 50 Years of case studies in paleopathology: a matter of how rather than what?
Emmanuele PETITI, Katharina FUCHS, Julia GRESKY, Nivien SPEITH

2:00 Life and death in a provincial capital: paleopathology of the Late Roman period Salona (Solin, Croatia).
Mario NOVAK, Nebojša CINGELI, Mario CARIĆ

2:15 Communicating paleopathological research to the public via artistic representation: experience as a participant in an artist-researcher collaboration.
Anne R. TITELBAUM, Mary K. LUCKING, Cynthia A. STANDLEY

2:30 An intersectional analysis of maxillary sinusitis in industrializing England.
Derek BOYD

2:45 Possible evidence for treponemal disease in Early Byzantine (ca. 500 AD) Olympia, Greece.
Julia GRESKY, Oliver PILZ

3:00 An exploration of early life stress, socioeconomic status, and longevity in post-Medieval Netherlands.
Sarah SCHRADER

3:15 Discussion

*** Cockburn Student Prize Entrant
++ International Journal of Paleopathology Early Career Conference Award Prize Entrant

3:30 pm – 4:15 pm **COFFEE BREAK AND IN-PERSON POSTER PRESENTATIONS** ***Diamond***
CHAIR: Amy ANDERSON

Periostosis prevalence, activity, and severity in the colonial Andes: a new look at inflammation and stress in Mórrope and Eten, Lambayeque Valley complex, Peru (1535-1750 CE).
Elyse ADAMS, Haagen KLAUS, Fabian CRESPO, Gretá KÜHNE, Liliana LEYVA, Kayley McPHAIL, Rut REYES, Jordan SHAFFER ***

Possible hereditary osteochondromas in a historical Chinese population.
Elizabeth BERGER, Wa YE SHAANXI, Liping YANG

Exploring disability and disease in early 20th century California: recent research on the Sonoma Developmental Center cemetery.
Alexis T. BOUTIN, Serena CHAN, Benjamin SMITH, Tristan NILES, Fernando PIMENTEL, Ursula SENGHAS-POLES

Preliminary insights into the relationship between vertebral neural canal size and mortality in late Roman and early Anglo-Saxon non-adults from England.
Devyn CALDWELL ***

Bioarchaeological approaches to female tobacco consumption in two skeletal populations from the Netherlands (1300-1829 CE).
Maia CASNA, Anna M. DAVIES-BARRETT, Sarah A. SCHRADER ***

Near total ankylosis of carpal and carpometacarpal joints linked to a traumatic injury.
Rachael HALL, Sarah SCHRADER ***

Nutritional disease in early China: a bioarchaeological analysis of scurvy in people from Shaanxi (2800 BC to AD 220).
Mocen LI, Charlotte ROBERTS, Peter ROWLEY-CONWY, Liang CHEN, Qinggang GENG, Dongyue ZHAO, Hanqing ZHAO

Detecting cribra orbitalia in post-mortem CT scans: implications for paleopathology.
Niels LYNNERUP, Chiara VILLA, Marie Louise SCHAADT ILSBY

Shadows of blood: diagnostic limits of hematologic malignancies informed from the Lisbon Identified Skeletal Collection, 20th century.
Carina MARQUES, Vitor MATOS, Eugenia CUNHA

Periodontitis prevalence and severity in Colonial Peru: a first approximation from Mórrope and Eten, Lambayeque Valley Complex (1535-1750 CE).
Kayley MCPHAIL, Haagen KLAUS, Fabian CRESPO, Elyse ADAM, Gretá KÜHNE, Liliana LEYVA, Rut REYES, Jordan SHAFFER ***

Cranial and postcranial cribrous lesions in two early medieval non-adult skeletal collections from Thuringia, Germany.
Jana Valesca MEYER

Presence of pelvic features in biological mothers shown by genetic relatedness in early Medieval Austrian cemeteries (7th-9th c. CE).
Doris PANY-KUCERA, Margit BERNER, Bendeguz TOBIAS, Ke WANG, Zuzana HOFMANOVÁ, Paul, KLOSTERMANN, Katharina LUFTENSTEINER, Karin WILTSCHKE-SCHROTTA, Falko DAIM, Johannes KRAUSE, Walter POHL, Sabine EGGERS

From the High Seas to the Low Countries: a likely case of scurvy in a post-Medieval Dutch non-adult.
Alex TUTWILER ***

Two probable cases of syphilis during the Qing Dynasty (1644-1912 CE) in Shanxi, China.
Sen YOU, He DONG, Zejian JING, Xinyu LI, Quanchao, ZHANG

4:15 pm – 6:00 pm **IN-PERSON PODIUM PRESENTATIONS** ***Plaza I-II***
CHAIR: Qian WANG and Alyson CAINE

4:15 Combined macroscopic and microscopic evidence of vitamin D deficiency during growth and development using multiple teeth and ribs in a collection from 17th-19th century Netherlands.
Amanda COOKE, Brianne MORGAN, Meghan LANGLOIS, Andrea WATERS-RIST, Alie VAN DER MERWE, Rachel SCHATS, Megan BRICKLEY ***

4:30 Vitamin D deficiency and pregnancy in early medieval Milan: study of two cases from the Ad Martyres and San Vittore al Corpo necropolises.
Lucie BIEHLER-GOMEZ, Valentina LUCCHETTI, Elisa PERA, Laura SISTO, Beatrice DEL BO, Alessandro PORRO, Lucrezia RODELLA, Mirko MATTIA, Anna Maria FEDELI, Cristina CATTANEO ++

4:45 A histological exploration of enamel formation disruption in 19th century settlers of Otago, New Zealand.
Lucy KAVALE-HENDERSON, Carolina LOCH, Peter PETCHEY, Hallie BUCKLEY, Annie SOHLER-SNODDY ***

5:00 Early childhood stress and puberty: Assessing the relationship between linear enamel hypoplasia and delayed pubertal timing in medieval London.
Melinda ELSER, Sharon DEWITTE, Mary LEWIS ***

5:15 Investigating child abuse using bioarchaeological evidence: the potential of integrating finite element analysis into an interdisciplinary approach.
Roberta MARINO, Melanie JEGU, Xinshan LI, Chris MILLARD, Elizabeth CRAIG-ATKINS

5:30 How the Developmental Origins of Health and Disease (DOHaD) hypothesis can aid understanding of infant and maternal health in Iron Age and Roman Britain.
Rebecca PITT, Mary LEWIS, Hella ECKARDT ***

5:45 Discussion

6:30 pm – 8:00 pm **PPA 50th ANNIVERSARY CELEBRATION AND BUFFET** ***Gold***

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SCIENTIFIC PROGRAM

WEDNESDAY, March 20

8:00 am – 12:00 pm **REGISTRATION** ***Plaza I-III Foyer***

8:00 am – 9:45 am **VIRTUAL AND IN-PERSON PODIUM PRESENTATIONS** ***Plaza I-II***
CHAIRS: Angela LIEVERSE and Kelly BLEVINS

8:00 A slow death: the paleopathological investigation of the impact of environmental pollutants on health in southern England, from the Roman to post-medieval period. (VIRTUAL)
Paige FALCO, Mary LEWIS, Gundula MUELDNER ***

8:15 Health and environmental contaminants of Prehistoric Iberian communities: insights from ancient dental calculus analysis. (VIRTUAL)
Dulce NEVES, Ana Maria SILVA, António Faustino CARVALHO, Emanuela Cristiani DANTE ***

8:30 Traumas of life – exploring the traumatic lesions in individuals from collective burials from the Military Hospital of São Jorge Castle, Lisbon (16th-18th centuries). (VIRTUAL)
Carina LEIRIÃO, Liliana MATIAS DE CARVALHO, Ana AMARANTE, Susana HENRIQUES CIDEHUS, Rosa RAMOS GASPAR, Ana CURTO HERCULES, Sofia N. WASTERLAIN

8:45 Ageing well!? 50 years of age-related disease in paleopathology. (VIRTUAL)
Katharina FUCHS, Jo APPLEBY, Fabian A. CRESPO, Julia GRESKY, Kathryn E., MARKLEIN, George R., MILNER, Katherine D., VAN SCHAIK, Molly, ZUCKERMAN, Niels LYNNERUP, Marie Louise SCHJELLERUP-JØRKOV

9:00 Visualizing orbital porosity using different imaging modalities.
Jo BUCKBERRY, Hannah KOON, Ashim ALI, Michael HEBDA, Adrian EVANS, Tom SPARROW, Andrew S. WILSON

9:15 The ethnobioarchaeology of porous cranial lesions: Insights into cribra orbitalia, porotic hyperostosis, and health in living adults from a contemporary population of tropical forager-horticulturalists.
Amy ANDERSON, Aaron BLACKWELL, Jonathan STIEGLITZ, Benjamin TRUMBLE, Thomas KRAFT, Daniel EID RODRIGUEZ, Raul QUISPE GUTIERREZ, Andrei IRIMIA, Ellen WALTERS ++

9:30 Discussion

9:45 am – 10:30 am **COFFEE BREAK AND IN-PERSON POSTER PRESENTATIONS** ***Diamond***
CHAIR: Kathryn MARKLEIN

Anatolian trepanation in context: the case of a trepanned skull from Classical period Karaman, Turkey.
Elizabeth BEWS, Alper Yener YAVUZ, Ahmet Ihsan AYTEK, Büşra ALADAG, Alpago Göksenin GÜZEL ***

Occupational stress and sex disparities in Schmorl's Nodes: An analysis of a historic skeletal sample.
João Tiago BRITO, Ana Luisa SANTOS

Sharing a 'short-form' version of the Index of Care.
Alyson CAINE, Ihuixaya TAPIA, Christopher CANZONIERI, Tony CAMERON, Lorna TILLEY ++

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Paleodemographic representation indices of the Medieval / Early Modern Age city cemetery (N > 22,000) in St. Pölten, Austria.
Fabian KANZ, Ronald RISY, Karl GROSSSCHMIDT, Christoph REISINGER, Barbara, RENDL

Postcranial trauma in the Middle Holocene Cis-Baikal.
Angela LIEVERSE, Rick SCHULTING, Vladimir BAZALIISKII, Artur KHARINSKII, Andrzej WEBER

Evaluating risks of mortality for individuals with concurrent versus non-concurrent bilateral linear enamel hypoplasias in Postmedieval London.
Kathryn MARKLEIN, Samantha YAUSSY ++

A case of gout on spontaneously mummified remains from Kėdainiai, Lithuania (17th-18th centuries AD).
Dario PIOMBINO-MASCALI, Rimantas JANKAUSKAS, Algirdas TAMOŠIŪNAS, Rokas GIRČIUS, Rūta BRINDZAITĖ, Justina KOZAKAITĖ

Changing health in North China's past populations: a preliminary paleodemographic and paleopathological investigation from Neolithic to Iron ages.
Mark SIMON, Qian WANG

An individual with congenital orofacial defect from the Ming-Qing period Wenchi cemetery in Shanxi province (1368-1911 CE): First case of cleft lip and palate from archaeological settings in China.
Xiaofan SUN, Yan LIU, Xiaoxiao TENG, Xueying REN, Quanchao ZHANG, Qian WANG

An interpretable machine learning model to predict age-at-death from a single radiograph of any large bone from archaeological contexts.
Katherine VAN SCHAIK, Moustafa ABDALLA ++

Evaluating risks of mortality for individuals with unilateral versus bilateral linear enamel hypoplasias in Postmedieval London.
Samantha YAUSSY, Kathryn MARKLEIN ++

10:15 am – 10:30 am **POSTER SYMPOSIUM: The Costs of Migration** ***Diamond***
CHAIRS: Marianne HOBBS and Alecia SCHRENK

Migration, movement, and identity in the precontact Four Corners region in the U.S.
Ryan HARROD, Anna OSTERHOLTZ

The Osteological Paradox as applied to migration: an example from Point of Pines Pueblo (A.D. 1200-1450).
Maryann HOBBS

Migration and disease: exploring the lived experiences of a young adult female with paralytic poliomyelitis from the Bronze Age, Tell Abraq, United Arab Emirates (UAE).
Alecia SCHRENK

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++ International Journal of Paleopathology Early Career Conference Award Prize Entrant

10:30 am – 12:00 pm **IN-PERSON PODIUM PRESENTATIONS** ***Plaza I-II***
CHAIR: Mario NOVAK

10:30 The significance of the oroantral fistula for understanding the cause of maxillary sinusitis.
Simon MAYS, Sarah STARK, Sonia ZAKRZEWSKI, Anna VERKONY

10:45 Integration of sedimentary DNA into a multimethod approach in paleoparasitology to reconstruct gastrointestinal parasite infections in the Roman and Medieval periods.
Marissa L. LEDGER, Tyler J. MURCHIE, Zachery DICKSON, Melanie KUCH, Piers D. MITCHELL, Hendrik POINAR

11:00 A meta-analysis study of parasites in ancient Egypt and Nubia.
Piers MITCHELL

11:15 Paleogenomic insights on tuberculosis from the laboratory of Robert Koch: comparing 19th century and modern genomes.
Elizabeth NELSON, Donikë SEJDIU, Gülfirde AKGÜL, Martyna MOLAK, Thomas SCHNALKE, Verena J. SCHUENEMANN, Sebastien CALVIGNAC-SPENCER

11:30 Catastrophic mortuary assemblages may reflect mortality from multiple causes in Early Modern Lithuania.
Rimantas JANKAUSKAS, Justina KOZAKAITĖ, Aleksandras KONOVALOVAS

11:45 Discussion

12:00 pm – 1:00 pm **LUNCH BREAK**

1:00 pm – 3:00 pm **SYMPOSIUM: 21st Century Paleopathology I** ***Plaza I-II***
CHAIRS: Jane BUIKSTRA and Elizabeth UHL

1:00 21st century paleopathology.
Jane BUIKSTRA, Elizabeth UHL

1:15 ONE Health and zoonotic brucellosis in deep-time perspective: concepts, contexts, and contributions. (VIRTUAL)
Robin BENDREY, Guillaume FOURNIÉ

1:30 'Hell for horses': equid health and human history.
Elizabeth W. UHL

1:45 Lessons from lesions: a ONE paleopathological approach to understanding entheseal change in elite horses from post-medieval England. (VIRTUAL)
Richard THOMAS, Renate LARSSEN, Holly MILLER, Ludovic ORLANDO, Gareth PEARCE, Rachel SMALL, Riley SNYDER, Eric, TOURIGNY

2:00 The ONE Paleopathology of Rio Zape, Mexico. (VIRTUAL)
Karl REINHARD, Joe BROWN

2:15 On the road to researching ONE Paleopathology in East Asia. (VIRTUAL)
Dong HOON SHIN, Jong HA HONG

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2:30 ONE Health in the past: first molecular insights on medieval rodents as animal reservoirs for plague and leprosy.
Verena SCHUENEMANN, Christian URBAN, Alette BLOM, Charlotte AVANZI, Kathleen WALKER-MEIKLE, Simon ROFFEY, Sarah INSKIP

2:45 Occupational health in the Viceroyalty of Peru: a possible case of massive poisoning with mercury.(VIRTUAL)
Elsa TOMASTO-CAGIGAO ***

3:00 pm – 3:30 pm **COFFEE BREAK** ***Diamond***

3:30 pm – 5:15 pm **SYMPOSIUM: 21st Century Paleopathology II** ***Plaza I-II***
CHAIRS: Jane BUIKSTRA and Elizabeth UHL

3:30 Squirreling away: characterizing and understanding skeletal pathology in *Sciurus vulgaris* as a baseline for leprosy studies.
Elliot ELLIOTT

3:45 Ancient pathogen research in the context of colonization of Mexico. (VIRTUAL)
María C. ÁVILA-ARCOS, Miriam BRAVO-LÓPEZ, Laura CARRILLO-OLIVAS, Jean CURY, Alejandro MERAZ MORENO, Maria DE LA LUZ MORENO CABRERA, Lourdes MÁRQUEZ MORFIN, Marcela SANDOVAL-VELASCO, Julie K. WESP, Flora JAY, Emilia HUERTA SANCHEZ

4:00 Zoonotic tuberculosis was an infection of inequality in a pre-conquest Mesoamerican city (Tlatelolco 1300-1521 CE).
Kelly E. BLEVINS, Josefina MANSILLA LORY, Jane E. BUIKSTRA

4:15 Pathogens between the seas: paleoecological and human historical co-production of Chagas' disease and American cutaneous leishmaniasis in Panama.
Robert G. WALLACE, Nicole GOTTDENKER, José CALZADA, Azael SALDAÑA, Luke R. BERGMANN, Luis F. CHAVES (VIRTUAL)

4:30 Humans are animals too: towards a unified standard of recording in zooarchaeological paleopathology.
Ellen GREEN

4:45 Ancient pathogens, microbes, and ONE Health: using paleogenomics and paleopathology to inform our understanding of present-day infectious disease risks within the ONE Paleopathology paradigm.
Molly K. ZUCKERMAN, Courtney A. HOFMAN, Sabrina B. SHOLTS, Kristen M. RAYFIELD, Rita M. AUSTIN (VIRTUAL)

5:00 ONE Health and palaeopathology: more than just adding animals.
Caitlin SMITH, Judith LITTLETON

5:30 pm – 6:30 pm **AWARDS AND CLOSING** ***Plaza I-II***
CHAIR: Mary LEWIS

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++ International Journal of Paleopathology Early Career Conference Award Prize Entrant

Periostosis prevalence, activity, and severity in the colonial Andes: a new look at inflammation and stress in Mórrope and Eten, Lambayeque Valley complex, Peru (1535-1750 CE).

Elyse ADAMS[1], Haagen KLAUS[1], Fabian CRESPO[2], Gretá KÜHNE[1], Liliana LEYVA[3], Kayley McPHAIL[1], Rut REYES[3], Jordan SHAFFER[1] ***

[1]George Mason University, [2]University of Louisville, [3]Universidad Nacional Pedro Ruiz Gallo

Periostosis is a classic paleopathological marker that has received new attention via pathophysiological and ecoimmunological understandings of inflammation. Empirical skeletal responses to, and recovery from, periosteal inflammation can provide nuanced perspectives upon stress-mediated patterns of inflammatory pathological states such as chronic infection and immune competence. Periostosis of the tibia can thus be a sensitive marker of community health and significant biocultural change. This work characterizes abnormal periosteal new bone formation prevalence, activity, and severity in the skeletal remains of Muchik people living in two Colonial-era Peruvian towns: Mórrope and Eten. We hypothesize that periostosis was both more common and severe in Mórrope (a setting of significant socioeconomic marginalization) than in Eten (characterized by greater ecological and economic stability). Tibiae of 211 adult Muchik people (Mórrope n= 73; Eten n= 138) were scored using new and more detailed scoring protocols developed by our team in conjunction use of prevalence estimations calculated using odds ratios. Odds ratios demonstrate a statistically significantly higher prevalence of periostosis in Mórrope. Other comparisons demonstrate consistent prevalence through time in Mórrope, though periostosis drops significantly in late Colonial Eten. Prevalence does not vary by sex at either site. Lesions at both sites were minor or moderate in expression, and nearly all cases were inactive and well-healed, occurring earlier in life. We discuss the findings in terms of differential Muchik approaches to buffering against stress, inflammatory phenotypes, and what resolved inflammatory disorders imply regarding earlier age-at-death and other inflammatory diseases (e.g., periodontitis) active at the time of death.

The ethnobioarchaeology of porous cranial lesions: Insights into cribra orbitalia, porotic hyperostosis, and health in living adults from a contemporary population of tropical forager-horticulturalists.

Amy ANDERSON[1], Aaron BLACKWELL[2], Jonathan STIEGLITZ[3], Benjamin TRUMBLE[4], Thomas KRAFT[5], Daniel EID RODRIGUEZ[6], Raul QUISPE GUTIERREZ[7], Andrei IRIMIA[1], Ellen WALTERS[1] ++

University of California Santa Barbara[1], Washington State University[2], Institute for Advanced Study in Toulouse[3], Arizona State University[4], University of Utah[5], Universidad de San Simón[6], Tsimane Health and Life History Project[7]

Porous cranial lesions are widely used by bioarchaeologists to infer compromised childhood health in past populations but are largely ignored in clinical practice. Consequently, their causes are debated and their consequences for health are unknown, though their association with younger adult ages at death at many archaeological sites implies lesion-correlated morbidity beyond childhood. We present the first exploration of porous cranial lesions and adult health in a population- representative sample of living adults. We analyzed existing cranial computed tomography scans and longitudinal health data collected from 2002-2020 on 375 living adults (45% female; aged 40-90 years) in the Tsimane population of lowland Bolivia, including clinical diagnoses, leukocyte counts, and blood biomarkers. Orbital roof lesions (*cribra orbitalia*) were associated with 3.8 times the hazard of symptomatic tuberculosis (95% CI: 1.3, 11.2) and a lower CD4+/CD8+ T cell ratio [β = -0.78, (95% CI: -1.52, -0.06)], a hallmark of age-related

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decline in immune function. However, orbital lesions were not associated with higher incidence of other respiratory infections, other markers of cell-mediated immunity, or adult hemoglobin levels. Cranial vault porosity (porotic hyperostosis) was not associated with differences in any measured health outcomes. These findings are consistent with the interpretation that lesion-causing processes in early life can result in heightened lifetime susceptibility to some infections. They join growing evidence linking cribra orbitalia and risk of mortality from respiratory infections. This project demonstrates the dual power of an ethnobioarchaeological approach to contribute to population health research in both past and contemporary populations.

Ancient pathogen research in the context of colonization of Mexico.

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In the last decade, the use of genomic tools to investigate ancient pathogens has yielded a wealth of information about the causative agents of diverse historic and prehistoric epidemic outbreaks. Some of the most devastating outbreaks were caused by the European colonization of the Americas. However, little is known about the pathogens responsible for these outbreaks, and the molecular aspects that could have made them particularly lethal for the Indigenous population. We use paleogenomic approaches to characterize the diversity of pathogens circulating during the colonial period of Mexico City (1510-1820 CE), focusing on individuals excavated from two sites—a church (n=22) and a Hospital (n=97) that served the Indigenous population. Using shotgun sequencing of the ancient DNA extracted from individuals and metagenomic analyses of the sequenced reads, we have identified pathogens involved in periodontitis (e.g. *Tannerella forsythia*), enteric fever (e.g. *Salmonella enterica* and *E. coli*), and respiratory infections (e.g. *S. pneumoniae*), among others. Our results illustrate the diversity of pathogens in Colonial Mexico City, prompting a necessary discussion on the multifaceted consequences of European Colonization.

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ONE Health and zoonotic brucellosis in deep-time perspective: concepts, contexts, and contributions.

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ONE Health, as a concept, explicitly acknowledges that the well-being of humans, animals and their shared environments are linked. ONE Health approaches, aimed at improving health understanding and outcomes, are interdisciplinary and multisectoral. They conceptually move away from a narrow anthropocentric health focus, allowing the interacting variables to be considered in holistic and integrated ways. This paper explores the contributions that a ONE Health approach can bring to the study of past disease at the human-domestic animal interface. It takes a deep-time perspective of zoonotic brucellosis as its case study. Brucellosis, a disease with significant health and economic consequences, being one of the most common global bacterial zoonoses. It is, however, challenging to identify from the archaeological record, with relatively few cases positively identified. The complex socioecological systems that support zoonoses involve humans, animals, and pathogens interacting within definable cultural and environmental contexts; as such, there is a diversity of datasets that can be employed to understand it in the past. Using a ONE Health perspective, this paper explores how the identification and understanding of past brucellosis may be improved by triangulating evidence and proxies generated through different methods. It first considers the conceptualisation of past zoonotic brucellosis at the human-animal interface. It then reviews the different methods for the identification of this disease (palaeopathological, osteological, historical, biomolecular, epidemiological). Finally, it explores how deep-time perspectives can contribute to current global challenges, and how enhanced knowledge of the past can be mobilised to meaningfully contribute to improving present health experiences.

Possible hereditary osteochondromas in a historical Chinese population.

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Between 2015 and 2018, twenty-three adult skeletons were excavated from a Ming period (A.D. 1368-1644) cemetery by the Shaanxi Archaeological Academy, at Upper Xuwucun, Shaanxi. These individuals belonged to a single family of the local gentry, and the genealogy of the family could be reconstructed from their tomb epitaphs, showing that the men were closely related. The skeletons were all of adults, including ten males and twelve females. Three of the ten men had proliferative lesions on their distal tibiofibular joints, in two cases bilaterally, and a fourth male had an enlarged lesion on the left mandibular condyle. Though lack of radiographs precludes a firm differential diagnosis, and not all typical features of the condition are present, we observed the lesions macroscopically, performed a differential diagnosis, and reached a preliminary conclusion that these lesions are the result of osteochondromas. Given the high frequency of the lesions and the fact that the men are related, we further propose that these may be a case of hereditary osteochondromas. We discuss how these apparent benign neoplasms may have impacted the lives of these men, who were local landowners but also engaged in agricultural labor and trade. Other possible diagnoses are also presented, with suggestions for future analysis.

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Anatolian trepanation in context: the case of a trepanned skull from Classical period Karaman, Turkey.

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The methods for performing trepanation are almost as numerous as the reasons that necessitated it in the first place. However, an updated, large-scale comparative study of trepanation in Anatolia is lacking. This presentation documents the case of a healing trepanation in an adult male from Karaman, Turkey within the context of wider Anatolian trepanation practices from the Neolithic period to the Late Ottoman period. In 2021 the skull of a male, estimated to be 25-35 years of age based on cranial suture closure and dental wear, was recovered during excavations of a Hellenistic-Roman period mass grave. The grave contained the remains of 10 individuals who were heavily commingled and poorly preserved, making it impossible to associate any post-cranial remains with the skull. This skull features a sharp, circular indentation overlying the sagittal suture at midline above lambda. In addition to morphoscopic examination, which identified new bone formation both endocranially and ectocranially, CT imaging confirmed penetration of the incision through to the endocranial surface. The case of the Karaman trepanation was compared with 52 other examples from Anatolia in terms of operative techniques, anatomical location, healing, and demographics. While women comprised the majority of early trepanations (n=18), trepanations overall were performed more commonly on men (n=34). Interestingly, differences in surgical technique are correlated with temporal changes (p<0.05), with survival rates increasing over time. The Karaman case is atypical for the period in terms of operative technique and anatomical location, but is consistent with young males undergoing the procedure and surviving.

Vitamin D deficiency and pregnancy in early medieval Milan: study of two cases from the Ad Martyres and San Vittore al Corpo necropolises.

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Since, 2018, the emergency excavations of the *Ad Martyres* and *San Vittore al Corpo* urban cemeteries have unearthed 319 and 92 tombs (respectively) dating from the Roman era to the Late Middle Ages. In the early medieval phases of both sites, representing 98 and 22 tombs respectively, three individuals showed signs of vitamin D deficiency: of these, two women had skeletal deformities attributable to osteomalacia including scoliosis, reduced rib-neck angle, *coxa vara*, severe bending of the pelvic bones, *protrusio acetabuli*, and narrowed pelvic outlet. The metabolic condition and skeletal deformities must have affected the quality of life of these women, causing bone pain, muscle weakness, fatigue, increased risk of morbidity, gait alteration, difficult and limited mobility, and abnormal compression of internal organs from deformations of the pelvic girdle and scoliotic curvatures with alteration of breathing patterns. In addition, each woman was associated with a fetus of about 25-36 gestational weeks: one was found *in situ* within the pelvic cavity and the other, unrecorded by the archaeologists, was recovered in the soil of the tomb associated with the skeleton. Under the mother-infant nexus framework, previous and existing maternal life course experiences – here vitamin D deficiency, aggravated from the current pregnancy – must have impacted the health of the growing fetus, though these factors are not visible

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macroscopically. Given the severe biomechanical abnormalities displayed in the skeletons of these women and the advanced development of both fetuses, it is probable that both the mothers and fetuses died due to childbirth complications.

Zoonotic tuberculosis was an infection of inequality in a pre-conquest Mesoamerican city (Tlatelolco 1300-1521 CE).

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Tuberculosis (TB) is a global disease that has impacted humans for millennia. Infections are caused by members of the *Mycobacterium tuberculosis* complex (MTBC), a group of genetically similar bacteria. Today, active TB incidence correlates with socioeconomic factors, such as overcrowding, poverty, and inability to access adequate nutrition. It is unclear, however, if TB had similar social determinants in pre-modern populations. When did TB become an infection of inequality, and did earlier lineages of the MTBC affect people differently? Our biomolecular work (forthcoming) shows that TB disease at Tlatelolco, a pre-conquest Mesoamerican city (1321-1500 CE), was caused by *M. pinnipedii,* a MTBC lineage that today affects seals and sea lions. To understand how this form of TB impacted inhabitants of Tlatelolco, we examined skeletons for changes consistent with bone and joint TB from a residential (normal mortality) barrio, Atenantitech (n=40), and four ceremonial center sacrificial contexts, Grupo Norte (n=52), Paso a Desnivel (n=45), Patio Sur (n=128), and Excavation 1964 (n=55). TB was not identified in the residential cemetery, but crude prevalence ranged from 8% to 20% in the ceremonial center deposits. We describe trends in the skeletal manifestation, evidence for perimortem ritual violence, and metabolic co-morbidities of these 31 cases. A previous study found that Tlatelolco sacrificed individuals were local to the Basin of Mexico, and possibly city residents. Informed by disease co-morbidity and the implications of human sacrifice, we argue that the risk of developing bone and joint TB was not equally distributed across Tlatelolco social classes.

Exploring disability and disease in early 20th century California: recent research on the Sonoma Developmental Center cemetery.

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Located in Glen Ellen, California, the Sonoma Developmental Center (SDC) opened in 1891, eventually serving thousands of residents who would today be described as developmentally or physically disabled, mentally ill, or deviating from social norms. Between 1892-1960, its cemetery received the remains of ca. 1913 residents – after which its use ceased and gravemarkers were removed. The SDC closed in 2018, and the core of its 945 acre campus is now slated for redevelopment. Our project aims to 1) support stakeholder efforts to memorialize the Cemetery, 2) improve long-term management of its cultural resources, and 3) understand the experiences of residents in life and death, through the lenses of disability and health. This poster focuses on the five-year period between 1915-1920, which was most notably characterized by the 1918-19 influenza pandemic. Analysis of primary sources (e.g., local and regional newspapers, bookkeeping ledgers) suggests the prevailing models of disability during this time

period and how they shaped the experiences of the SDC residents who died in the influenza pandemic. Descriptive analysis of gravemarkers and archival research (e.g., Directors' Biennial Reports to the State Commission in Lunacy; medical, death, and census records) permits the reconstruction of contextualized life courses for several residents. This is a particularly compelling historical moment to explore the relationship between disability, disease, and institutionalization. As such, our research builds on a small but growing body of paleopathological literature that documents how socially marginalized populations are among the most vulnerable to epidemic and pandemic disease.

An intersectional analysis of maxillary sinusitis in industrializing England.

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Exposure to poor air quality places an avoidable disease burden on the inhabitants of rapidly urbanizing areas in lower/middle-income countries (LMICs) through its association with negative health outcomes, including cardiovascular and respiratory disease, cancer, and death. We can look to the past to understand the social, economic, and environmental factors that structure exposure to poor air quality because conditions in the urbanizing areas of antiquity mimic those observed in LMICs today. This study evaluated the intersectional impact of social and economic marginalization on patterns of maxillary sinusitis in 302 adults (18+ years) from urban communities represented by four industrial-era English skeletal samples (ca. 1700-1857): Coach Lane, New Bunhill Fields, St. Bride's Fleet Street, and St. Peter's Church. Bayesian binary logistic regression predicted a lower probability of sinusitis among middle/upper-class Londoners compared to all other groups (0.17-0.22 vs. 0.34-0.43). Furthermore, Kaplan-Meier survival analysis failed to detect a difference in median survival time between individuals with (n=133) and without (n=169) sinusitis (47.50 vs. 45.50 years), providing no evidence that mortality was selective towards these lesions. These findings indicate the presence of environmental privileges, particularly access to clean air, among the wealthiest members of society who lived in one of England's most polluted cities at the time. Moreover, the results suggest that threats to health faced by inhabitants of major urban centers may appear early in the process of urbanization. Finally, these findings underscore the importance of actively testing the osteological paradox as opposed to passively mentioning it as a limitation of study.

Occupational stress and sex disparities in Schmorl's nodes: An analysis of a historic skeletal sample.

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Schmorl's Nodes (SN) represent invasive lesions resulting from the herniation of the nucleus pulposus of the intervertebral disc through the cartilaginous endplate into the vertebral body. This study investigated the interplay between occupation, sex, age-at-death and the presence, severity and location of SN. It is hypothesized that individuals with demanding occupations have more and more severe SN. Vertebral columns (Axis-S1) of 327 individuals (180 males/147 females), aged between 20-65 years, from the Coimbra Identified Skeletons Collection (years of birth 1844-1912) were analyzed. SN were recorded as present/absent, by severity, and location. Male occupations were divided between heavy manual (e.g., bricklayers) or light/non-manual (e.g., photographers). Females were mainly

housewives/housekeepers. Results revealed no statistically significant differences between the prevalence and severity of SN in males and occupational categories. Males (75.6%, 136/180) were significantly more affected by SN than females (38.1%, 56/147), and have more SN per individual (males=5.05, SD±5.20, females=1.80, SD±3.40). Severity grade 1 was more common (males=71.6%, n=129; females=36.7%, n=54) than grade 2 (males=51.7%, n=93; females=19.7%, n=29). In both biological sexes, the thoracolumbar region (97.3%) was the most affected, with minimal cervical (0.6%) and sacral (2.1%) involvement. T9 (46.1%, n=83) was the most affected vertebra in males and T11 (18.4%, n=27) in females. SN were mainly located at the center of the vertebrae (73.4%, n=856), followed by the canal (21.8%, n=255) and periphery (4.8%, n=56) for both sexes. The differences found cannot be attributed solely to occupational stress. Results challenge initial hypothesis and shedding light on gender-specific and anatomical differences in SN occurrences.

Visualizing orbital porosity using different imaging modalities.

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Orbital porosity is commonly observed in palaeopathology, but its aetiology is not fully understood. Sharing data is an important way for researchers to discuss these lesions. This research aimed to explore the potential of different imaging modalities for sharing examples of orbital porosity. Our objectives were to assess intra- and inter-observer error and inter-modality variation for a variety of imaging techniques.

Various systems have been used to describe orbital porosity, many of which assess 'severity' and 'stage of healing'. These systems are almost always developed and tested on skeletal specimens macroscopically. We used the Rinaldo et al (2019) method to assess to what extent orbital porosity can be recorded macroscopically and from different digital analogues using historic laser scans (from Digitised Diseases) and new structured light, cone beam CT and microCT scans. Agreement was assessed using weighted kappa and Fleiss kappa. We found moderate to substantial agreement for intra observer macroscopic observations. This decreased for all image modalities apart from conebeam CT and microCT. Interobserver agreement ranged from below chance to fair agreement across all modalities. When comparing each modality against macroscopic observations, microCT data was most similar, with moderate agreement for 'severity' and fair agreement for 'healing'. The data suggest that recording schemes are not applied in the same way, and that at present many imaging modalities do not capture the same detail observed macroscopically. Modality-specific recording systems are needed before we can use 3D models to explore orbital porosity. These should explore cross-sectional data.

21st century paleopathology.

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This presentation introduces the 21st Century Paleopathology symposium, which celebrates the 50th anniversary of the Paleopathology Association by illustrating 21st century innovations, achieved and

projected, that are facilitated by genomics and archaeogenomics integrated with rigorous, contextually rich paleopathology. Many of these examples will be developed within a ONE Health/ONE Paleopathology paradigm. ONE Paleopathology adapts the ONE Health approach of medical science, extending the latter's integrated environmental health concerns into the past, thus addressing topics of present-day public health concerns, including spillover risk factors, virulence, and pollution. This introductory presentation will first briefly review the histories of ONE Medicine and ONE Health, as they anchor ONE Paleopathology. It will also illustrate how, by using a ONE Paleopathology approach, biomedical advances in genomics mesh naturally with traditional observations of contexts and morphological observations of remains. Methodologically sophisticated developments in genomics and archaeogenomics thus encourage investigations of disease, past and present, to extend beyond morphological assessments. To take full advantage of remarkable new opportunities, an integrated, problem-oriented approach is required. The identification of significant questions receives primary emphasis in this presentation and in the symposium as a whole, rather than techniques. For example, this symposium will highlight new knowledge about the history of equine health, the disease and the colonial experience in the Americas, disease spillovers that have anchored familiar diseases such as leprosy and tuberculosis. It thus presents the global and technologically sophisticated viewpoints required to truly understand the complex histories of diseases that can inform both future research and clinical applications.

Sharing a 'short-form' version of the Index of Care.

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Bioarchaeological research into health-related care has advanced over the last decade, including the development of The Index of Care which outlined new recording standards (http://www.indexofcare.org). The Index of Care provides researchers with a free digital platform for use in recording and analyzing evidence suggesting care in archaeological samples, and promotes wider interpretation of the personal and social implications of this caregiving. Although sometimes identification of likely care provision can be made while skeletal remains are in-situ, many bioarchaeologists are not be able to use the platform during excavation. The next opportunity for identifying possible care provision comes when remains are removed from the field to the laboratory for cleaning, preliminary documentation and storage. To promote recognition of possible health-related care behaviors at this early, often time-stressed stage, a 'short form' version of the Index of Care has been developed. This takes researchers through an abbreviated version of the first three Steps of the Index, with the aim of 'tagging' those individual remains with evidence of pathology requiring care for more detailed bioarchaeology of care analysis in the future.
This presentation will share the Short-Form Index developed by the authors, which is part of the larger User-Friendly Index of Care Project that aims at increasing the accessibility of the Index to a non-specialist audiences interested in health-related care in the past. While emphasizing the importance of considering questions of disability and care at the point of excavation and recording, this presentation is also aimed at gaining feedback from meeting participants.

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Preliminary insights into the relationship between vertebral neural canal size and mortality in late Roman and early Anglo-Saxon non-adults from England.

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Vertebral neural canal size (VNCS) is known to be affected by adverse conditions during childhood growth. While the relationship between reduced VNCS and early mortality in adulthood has been demonstrated in bioarchaeological literature, the effect of this relationship in non-adult cohorts is less well understood. In this study, sliding calipers were used to measure the transverse (TR) and anteroposterior (AP) dimensions of the VNC of late Roman (n=41) and early Anglo-Saxon (n=36) non-adults from the South-East of England for the primary purpose of investigating how the societal upheaval of the Roman to Anglo-Saxon transition (410 AD) affected non-adult growth. Dental age based on tooth formation was plotted against TR and AP measurements of vertebral groups C5-C6, T9-T11 and L2-L4, to create growth profiles fitted with a LOESS smoothed curve generated from the geom-smooth function in ggplot2 in R. Growth profiles show a notable dip in VNCS between the ages of ~10-15 years, suggesting that death in pre/early puberty was associated with reduced VNCS. Since approximately 90% of adult VNCS is attained by 5 years of age, their early life stress increased these individuals' hazard of death in early adolescence. The physiological demands of the pubertal growth spurt, combined with environmental and social changes brought on by entry into a new life course stage, likely introduced new risks that individuals with reduced VNCS were less able to withstand. These preliminary results add to our understanding of the developmental origins of health and disease during this significant turning point in English history.

Bioarchaeological approaches to female tobacco consumption in two skeletal populations from the Netherlands (1300-1829 CE).

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The European history of tobacco and its societal impact has been extensively explored by historians, shaping prevailing narratives regarding its adoption and consequences. In the Netherlands, tobacco gained popularity among all socioeconomic classes by 1650 CE and (at least according to historical sources) predominantly among men. Women were discouraged from tobacco use, which was associated with impropriety and sexuality. However, it was recently argued that many Dutch women may have consistently engaged in some degree of smoking, although limited historical research specifically focused on women has made it challenging to build a "female" historiography of tobacco. This bias appears to be particularly evident in bioarchaeological studies conducted on Dutch populations, where most published research on past tobacco consumption only encompasses male individuals. We researched female involvement in tobacco use during the Dutch late-medieval and post-medieval eras by examining the presence of pipe notches and dental staining on 351 human skeletons (174 males and 177 females) dating 1300-1829 CE. In the late-medieval period, 7.8% of females and 10.3% of males displayed tobacco-related indicators, whereas in the post-medieval era, 30.1% of females and 49.2% of males exhibited these signs. No statistically significant sex-based differences emerged, yet variances might have existed in tobacco consumption methods (e.g., pipe smoking for men, chewing for women). Our study challenges prevailing narratives by providing evidence of female involvement in tobacco consumption in both the

late-medieval and post-medieval Netherlands, highlighting the need for a more inclusive approach in exploring the role of women in the history of intoxicants.

Unveiling ancient afflictions: traumatic pathology in the skeletal remains of Barcelona's laity buried at the Santa Caterina friary archaeological site in Barcelona (13th- early 16th centuries).

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This research presents a comprehensive analysis of traumatic lesions observed in the skeletal remains from funerary unit 221, which belongs to a guild buried at the exterior buttresses of Santa Caterina friary's church wall. The aim is to investigate whether this guild was subjected to harsher working conditions during the transition from the medieval to modern period and to explore if these conditions were higher than those experienced by the monastic and general population buried at the same friary. Our examination reveals a minimal number of 62 individuals, spanning the 13th-14th century medieval period (n=27) and the 15th-early 16th century modern period (n=35). Significantly, at least 14/62 individuals (22.6%) exhibit antemortem traumatic lesions, with a distribution of 10/27 (37.0%) from the medieval period and 4/35 (11.4%) from the modern period, these findings highlight a relatively high frequency of traumatic lesions within the guild, surpassing those in the monastic population 1/18 (5.6%) and the general population 2/26 7.8%) buried at this friary. This suggests a prevalent incidence of accidental trauma resulting from physically demanding activities. A discernible decrease in trauma frequencies from medieval to modern individuals may be attributed to the guild's transition to modernization. Furthermore, it significantly contributes to paleopathology by diagnosing exceptional cases, such as: a zygomatic arch fracture with reparative changes and a Driscoll type-III proximal trans-olecranon fracture of an ulna with secondary myositis ossificans. This research further delves into the intricate ways in which these injuries impact the daily lives of past guild members in Barcelona.

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Combined macroscopic and microscopic evidence of vitamin D deficiency during growth and development using multiple teeth and ribs in a collection from 17th-19th century Netherlands.

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Understanding vitamin D deficiency can contribute to broader interpretations of lifeways and health of past populations. However, to date, most studies have used one type of evidence or focused on a narrow period of life. Due to the chronological sequence of dental development, assessing multiple teeth from the same individual provides a comprehensive overview of health. This study is the first to combine evidence from interglobular dentin (IGD) in multiple teeth from the same individual, alongside skeletal indicators of rickets and micro-CT analysis of rib mineralization defects to improve diagnostic certainty

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and examine health over the lifecourse. A sample of 16 individuals (aged 1.5y-18y) was examined from three Dutch collections (Arnhem [1650-1829 CE] n=7; Eindhoven [1650-1850 CE] n=2; and Alkmaar [1716-1830 CE] n=7). All remains were assessed macroscopically, and per individual, one rib and two teeth underwent micro-CT imaging. Where skeletal indicators or rib mineralization defects were inconclusive, presence/absence of IGD for 10 individuals (63%) increased the diagnostic certainty for rickets. For 6 individuals (38%), disagreement could have resulted from micro-CT limitations, scurvy co-occurrence, differences between dental and skeletal development, and/or bone remodeling. Nevertheless, diagnostic certainty was improved when multiple indicators were used. Assessing multiple teeth allowed for the investigation of health at different periods of the lifespan and provided evidence for periods of vitamin D deficiency when little or none were found macroscopically or in the micro-CT rib reconstructions. This study demonstrates the value of combining datasets and supports including multiple teeth for investigating disease history across the lifecourse.

A comprehensive literature review of Pectus Excavatum.

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Pectus Excavatum (PE) is a common congenital defect of the sternum that today is treatable through surgery. Despite its prevalent occurrence, its representation in the palaeopathological and historical record is scarce. In severe cases, in which the sternal body is very depressed, the condition can interfere with cardiorespiratory functions, while in mild forms can be considered asymptomatic. This presentation is based on a systematic literature review that aims to synthesize the archaeological data. Google Scholar and Pubmed were used to scan the bioarchaeological literature for key terms such as 'Pectus excavatum', 'Chest wall' and related terms in English, German, Italian, French and Spanish to bring new light on this condition in antiquity. Twenty-five cases of PE were identified in the literature between 1990-2023 coming from archaeological contexts in all continents except Australia and North America. While the cases spanned chronologically from 700 BCE to the early 19th century, most were from the European medieval period. Contrary to the clinical literature that identified no sex-based frequency differences, females (15/25) were statistically more affected than males (8/25). The age at death of the individuals with PE ranged from juveniles to mature adults but the second group was predominant, indicating that in these individuals the condition was compatible with life. Poor preservation of the sternum in archaeological contexts may explain the scarcity of reports and sex-based variation seen in antiquity.

The association between osteoarthrosis and osteoporosis in the Coimbra Identified Skeletal Collection (late 19th – early 20th centuries).

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The relationship between osteoarthrosis (OA) and osteoporosis (OP) has been studied for a long time, with some – but not all – epidemiological studies showing a consistent link between OA and higher bone mass. This study aims to evaluate the potential association between OA and bone mass in a sample of

adults (N=264; females: 152 / males: 112) from the Coimbra Identified Skeletal Collection (CISC). Osteoarthrosis was evaluated macroscopically (absence / presence) in different joints; while bone mineral density (BMD) was assessed through bone densitometry at the femoral neck and used to diagnose osteoporosis (absence / presence). The presence of OA is associated with a diagnosis of osteoporosis in females but not in males – and the diseases co-occur in 30 females (30.9% of the females) and 10 males (14.9% of the males). BMD is significantly lower in individuals with OA – both in females ($BMD_{withoutOA}$=0.781 [0.13] / BMD_{withOA}=0.623 [0.12]) and males ($BMD_{withoutOA}$=0.840 [0.16] / BMD_{withOA}=0.704 [0.13]). A logistic regression was performed to ascertain the effects of BMD, sex and age (at death) on the likelihood of having OA, suggesting that only age is associated with OA. OA and OP share some risk factors, including age, and their cooccurrence is not unusual in older people. Following new biomedical evidence regarding the multiple convergent and divergent relations between OA and OP, this study suggests that these diseases are also mediated by demographic parameters, particularly age, showing a complex and multilevel association.

Squirreling away: characterizing and understanding skeletal pathology in *Sciurus vulgaris* as a baseline for leprosy studies.

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Certain populations of modern red squirrels (*Sciuris vulgaris*) in the United Kingdom harbour a strain of *M. leprae* known to be circulating in human populations as early as the seventh century CE. Since *M. leprae* infection in humans can result in specific skeletal lesions, the question is whether the same is true in squirrels, and whether we can differentiate those lesions from nonmetric and common pathological lesions. I undertook macroscopic analysis of 27 skeletons and over 600 data records of red squirrels, the latter from archives of the National Museum of Scotland (NMS) and the former from modern reference collections. This helps form the baseline required to compare potential *M. leprae*-associated lesions against. Trauma associated lesions predominate, followed by infection associated with fractures or dentition. In the NMS collection, there is one case with bilateral inflammatory lesions that one would expect in a leprosy case, but the lesions are located on the femurs rather than the tibiae. Arthropathies of caudal vertebrae and distal tibiae may obscure inflammatory changes secondary to *M. leprae* infection. Incisor loss was not found, which is not unexpected – while incisor loss due to maxillary resorption is common in human cases of *M. leprae* infection, squirrels cannot live long without incisors. Overall, there is an increasingly distinct pattern of trauma and both arthropathic and enthesopathy changes in the sciurid skeleton that will help to differentiate from incidences of bone-induced leprous changes.

This is part of an ongoing PhD project, entitled “Defining the prevalence of leprosy in peridomestic animals using osteoarchaeology,” funded by the Future100 Scheme at the University of Leicester.

Early childhood stress and puberty: Assessing the relationship between linear enamel hypoplasia and delayed pubertal timing in medieval London.

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The timing of puberty is a sensitive indicator of growth conditions. Bioarchaeologists have recently explored the average age at which individuals reach key stages of puberty in past populations, e.g., to evaluate its association with chronic conditions such as tuberculosis. This study contributes to our understanding of how the timing of sexual maturation covaries with other paleopathological evidence of developmental stress. Specifically, we examine the association between linear enamel hypoplasia and puberty stage using data from the skeletal remains of 243 adolescent individuals (10-25 years) from medieval St. Mary Spital, London (c. 1120-1540 CE). The expected ages of attainment for each puberty stage (initiation, acceleration, peak height velocity, deceleration) were based on the average age range of stage attainment for medieval adolescents calculated by Lewis's method. An individual within a particular puberty stage whose minimum age estimate was older than the average age provided for medieval adolescents for that stage were considered to be delayed in their development. Chi-square analyses showed that among attritional burials, significantly more individuals with delayed puberty had LEH on the right mandibular canine than individuals with typical pubertal timing (43.4% vs. 25.6%, p = 0.07). When individuals from the mass graves (putative famine victims) are included, this difference was not apparent (39.2% vs. 37.2%, p = 0.7). These results may reflect the persistence of poor conditions from the time of mandibular canine formation through adolescence for these individuals, or perhaps that stressors during early childhood are mechanistically linked to growth and development during adolescence.

A slow death: the paleopathological investigation of the impact of environmental pollutants on health in southern England, from the Roman to post-medieval period.

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Traditionally, research into past environmental health has relied on comparing the prevalence of skeletal pathology in urban and rural populations. This project investigates how environmental pollutants impacted past health in England and explores whether toxic trace element concentrations are connected to the development of skeletal pathologies. The selection of which pathologies to investigate was determined through assessing modern environmental toxicology literature relating to toxic elements and the development of bone diseases today. This study focuses on the impacts of aluminium, arsenic, antimony, cadmium, lead, and tin. The sample population comprised 650 individuals from one Roman (urban), two early medieval (rural and suburban), three late medieval (suburban and urban), and two post-medieval (suburban and urban) sites in southern England, dating from 300 to 1896 CE. Individuals were evaluated for macroscopic signs of maxillary sinusitis, visceral rib lesions, vitamin D deficiency, anemia, osteoporosis, and neoplastic diseases. Radiographic analysis was used to support the final diagnoses. Preliminary results for the macroscopic assessment exhibited the highest rates of maxillary sinusitis during the Roman (28.0%) and post-medieval (27.0%) periods. Visceral rib lesions increased in prevalence from 2.0% in the Roman period, to 9.0% in the post-medieval period. The highest rates of vitamin D deficiency were observed during the Roman (27.0%) and post-medieval periods (22.0%).

Osteoporosis was found at the highest prevalence during the late medieval (23.5%) and post-medieval (18.7%) periods. Lesions associated with anemia and neoplastic disease range from 3.9% to 10.2%. Future work will include toxic element analysis utilizing the p-XRF and ICP-MS.

Demonstration of the existence of spinal tuberculosis in ancient Sicily (ca. 7th-5th centuries BCE): the first morpho-radiological evidence.

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Researchers of skeletal tuberculosis have noted the surprising lack of evidence for it in pre-18th century Sicily. The disease has a long history in other areas of the Mediterranean, with the earliest TB case identified via aDNA dating to 9,000 years BP from Atlit Yam. Here we present the first morpho-radiological evidence of a case of PD ever discovered in Sicily. The two thoracic vertebrae examined here were found amongst commingled skeletal remains (MNI=50) within a large monumental artificial cave tomb associated with a 7th-5th centuries BCE Sicanian population from the Baucina necropolis (Palermo). The two vertebrae – belonging to an adult individual of probable female sex – show the typical macroscopic characteristics of PD with a collapse of the anterior portion of the vertebral bodies (more evident on the uppermost vertebra of the preserved spinal segment), as well as a fusion respectively of their inferior and superior articular facets. We conducted conventional radiography in the antero-posterior and postero-anterior projections views and CT scans using sagittal, coronal and transverse sections. Using a combination of macroscopic and radiographic information we conducted a differential diagnosis including trauma/fracture, DISH, brucellosis, osteoarthrosis, and a clear abscess inside the vertebral body of the upper vertebra could be observed. While more in-depth analyses are already being planned, the furnished evidence appears strong enough to propose this as Sicily's first report of PD. In addition, it raises the question of why more cases of skeletal TB have not been found on the island, which will be explored in the future.

Ageing well!? 50 years of age-related disease in paleopathology.

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Age and ageing are critical factors in the development and course of disease in the past and present. This was established by the 2022 symposium "It's complicated – the relationship of age and disease in paleopathology". Yet, the complex relationship between skeletal age and the development of pathological lesions challenges our everyday practice in many ways. The biological connection between ageing and disease processes is not the only reason for this. It also lies in the methodological and thus interpretative circular reasoning behind the use of osteological age markers. The founding of the PPA 50

years ago was a decisive milestone for this discourse, and we can say ensures that it "never gets old". In this sense, a systematic approach to the topic and all its facets is due. In this presentation, this will be demonstrated by means of a literature review. Additionally, it intends to motivate people to engage more strongly with the inter-relationships between ageing and disease in their everyday academic work and thereby hopefully contribute to the healthy ageing of the PPA over the next 50 years.
We add to the discussion by addressing the following questions:

- How age-related disease and disease-related age impacts our research practice
- How this is visible in our scientific discussions and affects our interpretations
- How it was dealt with in the past 50 years
- Can we devise a multilateral perspective to overcome the challenge in the future (methods, standards, terminologies, synergies)?

A possible case of crucifixion from Roman-period Fenstation, Cambridgeshire, England.

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A potential case of crucifixion from Fenstanton, Cambridgshire (England) is presented. The excavated site, south of the *Via Devana*, has five small cemeteries dating to the 4th century AD (late Roman Period). From the retrieved 48 skeletons presenting ordinary pathological and stress markers, Skeleton 4926 (Grave 4925) clearly stands out. It is badly preserved and belongs to a male individual. Dental wear places him in the 25–35-year-old age group, which is supported by the slight development of degenerative-arthritic changes in his spine. Genetically, Skeleton 4926 was found not to be obviously different to other individuals of the same period in Cambridgeshire. It had the forearms crossed symmetrically across the lower torso, hands on the pelvis. There were 12 iron nails around the body most with traces of wood on them. A thirteenth nail was found *in situ* penetrating the right calcaneum horizontally, below the *sustentaculum tali*. The nail (5.15 cm in maximum length) extended approximately 2 cm outside the bone on the lateral side, and approximately 2.4 cm on the medial side. The nail passes horizontally from the outside of the foot immediately below the distal lateral malleolus of the fibula. This evidence suggests a possible case of crucifixion, and additional lower leg skeletal evidence shows that this individual could have been subject to immobilisation (tying, shackling). This case is compared with the few other crucifixion cases present in the literature and the practice of crucifixion in Britain is discussed.

An overview of blast trauma in World War I soldiers from selected cases of the Italian front.

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In both paleopathological and modern war contexts, trauma analysis is necessary to understand conflict dynamics and potential human rights violations, respectively. Recent literature highlights how historical armed conflicts can offer valuable insights into the interpretation and analysis of blast trauma, an area which still needs refinement. Ten cases of victims from World War I on the Italian Alpine front are presented to enhance understanding of the complexity of blast trauma. Five cases involved grenade

fragments or shrapnel projectiles embedded in the bones, connecting them to a mechanism of secondary blast trauma. These victims exhibited multiple comminuted fractures in addition to the embedded projectiles. The remaining five cases reflected a range of diagnostic difficulty to illustrate that while common patterns can be observed (e.g., potential traumatic amputations), such injuries could also be associated with different traumatic mechanisms, including complex fractures caused by machine guns. In these cases, the contextual complexities, comprising taphonomic effects and post-war exhumation activities, significantly complicate diagnoses. The small sample size, combined with numerous unknown variables (e.g., the subject's distance from the explosion and different weapon mechanisms) mean assessment of prevalence is of limited value, however, six out of ten subjects' skulls show trauma (the most affected district). Qualitative trauma analysis provided useful diagnostic details, including identifying specific fracture patterns and the presence of irregular projectile trajectories associated with blast trauma. Notably, three cases lacked radiating fractures despite 12mm shrapnel trauma. In conclusion, the cases presented provide valuable insights for both historical and contemporary investigations into war victims.

Humans are animals too: towards a unified standard of recording in zooarchaeological paleopathology.

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Due to a divergence in the development of human and faunal pathological studies in bioarchaeology, the two subjects are currently treated very differently both in the lab and the literature. As the response of mammalian bone to stress is similar across species, methods of recording and reporting pathology would benefit from a unified approach, utilising the strengths of both zooarchaeological and palaeopathological methods. This is illustrated using a case study of dogs from Roman Britain. A large assemblage of disarticulated canine remains (NISP=5463, MNI=139) was examined for pathology and recorded using a hybrid system of human and zooarchaeological methods. Skeletal pathology was observed in 2.2% (n=98) of the sample. Comparison of this assemblage with other studies of dogs in the Roman world revealed several problems inherent to the different methods used for quantification, diagnosis and description of pathological lesions within the wider faunal pathology field. As a result, in many cases it was impossible to compare assemblages, limiting the interpretation and contextualisation of the remains. This paper proposes a unified, standardised methodology for recording and reporting faunal pathology in order to maximise the comparative potential of data. This approach focuses on clear, simple definitions of descriptive terms and the use of true prevalence rates for reporting pathological lesions. Lesions should be sorted into categories based on type: joint changes, trauma, inflammation, lytic and other, and reported per element. This standard is designed to help faunal pathology move beyond its current case study focus towards wider population studies.

Possible evidence for treponemal disease in Early Byzantine (ca. 500 AD) Olympia, Greece.

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Within the last years, five cases of skeletons with periosteal changes of the bones of the lower extremities and saber shin tibiae from mainly Roman/Early Byzantine times around the Mediterranean Sea from Spain, France, Italy, Croatia and Turkey have been reported. These changes have been diagnosed macroscopically as treponemal disease. At least 337 graves dating from the 5th to 7th centuries AD have been documented in excavations starting in 1875 at the site of Olympia, Greece. Unfortunately, only a very small number of skeletons had been stored for further research. Altogether 20 adult individuals and one infant from seven single, two triple and one multiple burial could be investigated macroscopically. Two adult males of 20 adult individuals show symmetrical periosteal reaction on the tibiae (in one case also on the fibulae and distal femora) with development of saber shin deformity. No cranial or facial lesions could be observed. Considering potential differential diagnoses, endemic syphilis seems to be a likely diagnosis. However, so far, there is no genetic evidence of the pathological changes being caused by endemic syphilis. Combining the new find with the five cases of possible treponemal diseases published within the last years, a pattern of possible endemic syphilis seems to emerge in the arid areas around the Mediterranean Sea. This is an important contribution to the discussion of the origin and spread of treponemal diseases. More research on larger samples in the Mediterranean region is necessary to produce statistically relevant data on the paleoepidemiology of possible endemic syphilis.

Caring for their teeth: dental health in nonadults from two Roman Imperial age communities from Italy.

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Documenting oral pathologies in non-adult individuals is often either overlooked or rarely present in the paleopathological assessment of ancient communities, despite its informative potential about childcare in relation to weaning patterns, postweaning diets, and hygienic practices. In an ongoing research project, we aim to compare the non-adult oral health status and trace developing trends, from childhood through adulthood, in two large Imperial Roman samples from Italy. Here, as a first step of the study, we present data on biologically nonadult individuals, ranging from 2 to 20 years, from Portus Romae (Isola Sacra necropolis, Latium I-III cent. CE; N=132) and Velia (Porta Marina necropolis, Campania, I-II cent. CE, N=45). A total of 844 deciduous and 1186 permanent teeth/alveoli were examined for the presence of caries, antemortem tooth loss, and abscesses. We recorded only two cases of abscesses at the second permanent molars in Isola Sacra. Carious lesions affect 4.5% of deciduous teeth and 4.1% of permanent ones. In the primary dentition, caries was recorded only on molars; affected permanent teeth comprise molars and premolars. As expected, individual frequencies increase with age. Comparing the two necropolises, Velia shows significantly higher frequency than Isola Sacra in all age groups considered (2-6 years; 6-10 years; 10-15 years; 15-20 years) and in total (41.9%; 17.4%) suggesting differences that may be of socioeconomic origins based on archaeological and contextual information.

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Osteoarthrosis in Mendoza, Argentina, during the late Holocene: anatomical specificity and links to economic changes.

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This research explores the prevalence and distribution of osteoarthrosis (OA) in Late Holocene hunter-gatherers (n=18) and farmers (n=9) from Mendoza, Argentina to identify links between OA and economic subsistence. Twenty-seven adult individuals (19 males, 8 females, 21 young-middle adults, and 6 older adults) from five archaeological sites (2000-500 years BP) were analyzed. Joints were diagnosed with OA based on eburnation for synovial joints, or two of the following joint lesions in all joints: articular surface porosity, new bone formation, or increased joint surface area. Lesions were assessed in appendicular synovial joints (shoulder, elbow, wrist, hand, hip, knee, ankle, and foot) and synovial and non-synovial joints of vertebrae. Data were analyzed by sex, age, and subsistence behavior. Appendicular OA was found in 54% of the individuals, evenly distributed across upper and lower limb joints, with no significant sex or age differences. In the spine, prevalence was 67%, with OA predominantly in the lower segments of cervical, thoracic, and lumbar vertebrae, with no significant differences across ages and sexes. Only 37% displayed both appendicular and spinal OA. No differences in pattern or frequency were observed between hunter-gatherer and farmers, and only one individual had no OA in any joint. The homogeneity of OA in these groups suggests they resulted from typical day-to-day activities experienced by all in the region. Further research would validate these initial results and contribute to a comprehensive understanding of the health of these populations.

Near total ankylosis of carpal and carpometacarpal joints linked to a traumatic injury.

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Ankylosis of hand and wrist bones has been associated with multiple aetiologies such as genetic and congenital factors, degenerative joint diseases, and trauma. The fusion of two or three carpals are frequently documented in archaeological and medical literature - however, near total carpal and carpometacarpal ankylosis is rarer. One such case was observed in an ancient Nubian individual (2500-1500 BCE) from Abu Fatima, a peri-urban site located ~10km from the capital city of Kerma. The well-preserved middle adult (35 -50 years old) male presents complete ankylosis of the left carpals and metacarpals, excluding the pisiform and first metacarpal. Radiographs reveal that each carpal is distinct, confirming individual formation during ontogeny. Evidence of a traumatic injury that resulted in an oblique impaction fracture with apex-dorsal torsion was observed on the distal half of the second metacarpal. The proximal joints of the scaphoid and lunate show signs of resorption, and the head of the ulna has atrophied. A curved morphology of the distal third of the ulna, which articulates with the ankylosed wrist, suggests anteromedial dislocation. The left radius is absent, limiting a comprehensive interpretation. Porosity and pitting in all left carpals indicate an inflammatory reaction. Likely, the individual experienced long-term limited movement or immobilization of the hand and wrist following a severe traumatic injury. Differential diagnoses considered inflammatory joint diseases and

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osteoarticular tuberculosis. Cases of hand and wrist ankylosis provide a unique opportunity to explore the repercussions on limited manual dexterity, object use, and overall quality of life.

Migration, movement, and identity in the precontact Four Corners region in the U.S.

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The Basketmaker III (BM III, AD 500—700) through the Pueblo III (PIII, AD 1150—1350) periods in the Four Corners region of Colorado, Arizona, New Mexico, and Utah were periods of extensive migration due to climate change, ideological shifts, and social organization. Indicators of physiological stress (porotic hyperostosis, cribra orbitalia and traumatic lesions) were observed in 571 skeletal individuals, including a number of commingled remains, from Aztec Ruins, La Plata, Mesa Verde, Sacred Ridge, and several large sites in or around Chaco Canyon in order to understand the health impacts of this mobility. Results indicate increasingly complex social organization from the BMIII to the PIII period is associated with changing frequencies of markers of nutritional stress as well as patterns of violent interactions. There was an increase in porotic hyperostosis/cribra orbitalia (BMIII-PI 28/103 27.18%; PII-PIII 91/232 38.24%) and a decrease in cranial trauma (BMIII-PI 45/146 30.82%; PII-PIII 56/229 24.45%). With increasing population size and population density coincident with the reliance on agriculture, health scores suffer for the majority of individuals, but evidence of trauma possibly related to violence decreases. In past publications we have argued that pattern reflects different systems of social control. The time depth of this analysis shows both continuity and change, with dynamic groups moving on the landscape, adapting to changing environmental conditions and developing complex social interactions that regulated their communities.

The Osteological Paradox as applied to migration: an example from Point of Pines Pueblo (A.D. 1200-1450).

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This case study uses the osteological paradox to aid in understanding the effects of migration on ancient skeletal remains. The environs of the Point of Pines Pueblo in east-central Arizona was a zone of interaction between multiple ancient cultural groups between AD 1200 and 1450. Therefore, the human remains from the site can reflect the intricate dynamics between migration and health over time. This study created biological profiles for the skeletal remains of 199 individuals previously excavated from the pueblo, with age categories ranging from Infant through Old Adult. Observable skeletal and dental pathology and/or trauma were noted as present or absent. This information was used in conjunction with existing archaeological data on the site's occupation, construction, development, cultural associations, and burial context to differentiate individual group affiliations. Further, the archaeological data was used to estimate population changes over time. The osteological data were examined in light of individual migration status and population size estimates from three consecutive phases of occupation. Standardized mortality ratios—using population estimates derived from the archaeological data and burial data—were calculated for each phase to account for differences in estimated population. Ratios were then compared by phase and group affiliation to calculate differences in mortality. Analyses

revealed no notable health disparities between the presumed migrant population and the local indigenous group (<1% difference in each phase), yet there were differences between mortality rates over time. In all three phases local mortality ratios exceeded migrant ratios—by 5.7%, 42%, and 0.7% chronologically. It appears that health disadvantages often attributed to migrants were instead observed in the local population.

Catastrophic mortuary assemblages may reflect mortality from multiple causes in Early Modern Lithuania.

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Recent biotechnological advances, especially in pathogen aDNA analysis, allow more precise answers on causes for morbidity and mortality in the past. The refinement of these techniques also permits analysis of large samples, providing epidemiological data on a larger scale. Our study aimed to apply Oxford Nanopore technologies for the detection of pathogens in samples from two different archaeological contexts in 17th – 19th century Lithuania indicative of a catastrophic mortality event (e.g., irregular inhumation patterning, higher than expected percentage of juveniles, no traces of violence): three pits containing a total of 101 individuals from Vilnius St. Stephen's church cemetery (18th-19th centuries), and two mass graves with a total of 36 individuals from Kėdainiai (17th c.). Sampling was performed from the dental pulp of 137 third permanent molars. Analyses revealed heterogeneity in bacteria species present within and across the individuals that may have contributed to their mortality (e.g., *Clostridium tetani, Clostridium botulinum, Bordetella pertussis, Salmonella enterica, Klebsiella pneumoniae, Rickettsia typhi,* etc.). However, no single pathogen could be identified as the single cause of mortality in the individuals. While it is possible that a pathogen undetected via aDNA analysis was the primary cause of high-scale mortality, heterogeneity in pathogen profiles suggests that mortality risks are varied and should be considered at an individual-level in these and other contexts.

Paleodemographic representation indices of the Medieval / Early Modern Age city cemetery (N > 22,000) in St. Pölten, Austria.

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Representativeness estimators and key demographic indices can identify age-related sample bias in archaeological skeletal samples, which can hinder properly interpretating frequencies of palaeopathological conditions. Six well-established methods were applied to the largest skeletal collection from a single-site cemetery excavation in Europe, namely the Cathedral Square of St. Pölten, the primary burial ground for the town from the 9th century to 1779. More than 22,000 individuals were excavated from this cemetery between 2010 and 2022. An abridged life table was constructed, and various demographic estimators and indices were calculated. While most calculated values met the criteria for a representative sample, two calculations deviated. The D(5-9)/D(10-14) ratio was 1.5, falling below the recommended ≥2.0 by Masset. An overrepresentation of 10-14-year-olds is more probable than an underrepresentation of 5-9-year-olds, considering that the rejection criteria of Weiss do not apply [Q(10)>Q(15), Q(0)<Q(15)]. An enhanced influx of 10-14-year olds from the surrounding rural region because of the possibility of craft apprenticeship is the most plausible explanation. The

D(<1):D(15+) ratio is 1:10, not within the representative range of 5-8:10 according to Angel. This suggests a notable deficit of under-one-year-olds. With a total of 1,204 fetal and perinatal individuals recovered in perfect preservation, bias due to acid soil properties or poor excavation skills seems unlikely. Probably, fetal and stillborn have been buried in other, maybe more private, places than the central burial cemetery. Nevertheless these over- and under-representations have to be considered in future studies concerning estimations of pathology prevalences in this population.

A histological exploration of enamel formation disruption in 19th century settlers of Otago, New Zealand.

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Dental enamel forms throughout childhood in a sequential and predictable pattern, providing a kymographic record of growth disruption as it does not remodel, unlike other hard tissues. Here we explore physiological stress markers in the enamel of individuals from European and Chinese immigrants and colony-born children interred in unmarked or 'lost' graves in four cemeteries in Otago, Aotearoa/New Zealand; St John's Anglican Burial Ground (c1870-1900AD, n=18), Ardrossan Street Cemetery (c1861-1866AD, n=20), Gabriel Street Cemetery (c1866-1890AD, n=8), and Drybread Cemetery (c1880-1904AD, n=9). Ethnicity was determined through isotopic, mDNA and material culture evidence. Dental samples were prepared following established methods and examined using polarised light on a Nikon N*i*-U microscope with incorporated DS-Ri2 camera. Accentuated lines (ALs), changes to regular enamel structure indicating enamel secretion disruption, were identified in composite digital images analysed using FIJI™ software. 92.7% of individuals (51/55) exhibited evidence of AL formation, and prevalence varied between groups of different ethnicities, climactic and socioeconomic backgrounds. Chinese individuals exhibit a consistently high prevalence of ALs in comparison to European immigrants and their colony-born children. AL formation peaked in the first year of life for all groups. Early New Zealand immigrants were attracted to the colony by the promise of improved life prospects for themselves and their children, and the embodiment of physiological stress as evidenced by AL formation may reflect push factors that stimulated emigration from the 'old' world to the 'new'; however, the presence of ALs in colony-born children suggests life in Aotearoa also had its own challenges.

Integration of sedimentary DNA into a multimethod approach in paleoparasitology to reconstruct gastrointestinal parasite infections in the Roman and Medieval periods.

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Visualizing helminth (worm) eggs using microscopy has provided evidence for gastrointestinal parasites that infected individuals living in the Roman and Medieval periods in Europe. However, microscopy has major limitations including the inability to make species-level identifications and challenges in identifying

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poorly preserved eggs. This research aimed to overcome these limitations by incorporating sedimentary DNA (sedaDNA) methods, to increase our understanding of the prevalence and diversity of parasites in the Roman and Medieval period. We adapted sedaDNA methods and target enrichment to sequence parasite DNA from 19 fecal samples collected from 10 sites located in Belgium, Israel, Italy, Portugal, Serbia, and Turkey dating to the Roman and Medieval periods (2nd C. BCE–16th c. CE), which were previously studied using microscopy. Parasite DNA was recovered from 53% (10/19) of the samples. Microscopy recovered parasites not identified using sedaDNA in 11 samples. Ten samples contained roundworm (*Ascaris*) DNA alongside microscopically identified eggs, an additional five samples contained roundworm eggs without DNA recovered. Whipworm (*Trichuris*) eggs were found in seven samples, while whipworm DNA was recovered from two samples, one of which had no preserved eggs. Liver fluke (*Dicrocoelium dendriticum*) DNA and eggs were found in one sample. We show that the addition of sedaDNA in paleoparasitology allows for identification of poorly preserved eggs and species designations in some cases. However, current limitations of our method highlight the recommendation for combined use of microscopy. With further refinement, sedaDNA methods are promising to allow for improved parasite identification, genomic and phylogenetic studies in paleoparasitology.

Traumas of life – exploring the traumatic lesions in individuals from collective burials from the Military Hospital of São Jorge Castle, Lisbon (16th-18th centuries).

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Skeletal samples from graveyards of military hospitals, such as the one inside the São Jorge castle (16th-18th centuries), are rare. This cemetery was used at six different moments in time. The third phase was characterized by collective burials, from which a sample of 56 skeletons (57.1% non-adults, 32.1% adults, and 10.8% individuals of undetermined age) was recovered. All individuals for whom it was possible to estimate sex were males (14/18). This work aims to analyse the traumatic lesions of these individuals and discuss the possible relation with the military service. All traumatic lesions were macroscopically identified and described, being their radiological study in progress. In all, 37.5% of the individuals presented traumatic lesions (12.5% non-adults and 50% adults). Traumatic lesions were identified in the skull, vertebral column, ribs, humerus, metacarpals, patella, and foot phalanges. The two most frequent traumatic lesions were the fusion of the intermediate and distal foot phalanges (10.7%) and the rib fractures (7.8%). Foot phalanges fusion can occur in accidents or in demanding physical activities. Rib fractures can result from a blow to the thorax, interpersonal violence, or work accidents. Since these individuals were associated with military service, they were probably subjected to hard work and/or interpersonal violence. Although military training was performed, the need of quick and coercive recruitment at that historical period could result in situations of acquiring experience on the battlefield itself. Therefore, it is believed that some of the observed traumatic lesions may have been related to the warfare environments which these individuals experienced.

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Nutritional disease in early China: a bioarchaeological analysis of scurvy in people from Shaanxi (2800 BC to 220 AD).

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Scurvy, a deficiency of dietary vitamin C, can cause symmetrical periosteal new bone formation and/or porosity on the skull, scapulae, ribs, long bones, and ilia. Today, it often affects people who have a poor diet lacking fresh fruit and vegetables, women of reproductive age, and children. In bioarchaeology, scurvy has been linked with agriculturally based economies, weaning, and famine. In China and the rest of Asia, however, bioarchaeological data are sporadic, and information on scurvy prevalence scarce. To address this gap, 249 skeletons excavated from Shaanxi, China (2800 BC to 220 AD) were macroscopically examined. Periosteal new bone formation at multiple sites of the aforementioned bone elements was found in 12 of the 90 observable individuals (13.3%). Scurvy was considered a possible diagnosis for the abnormalities observed, with differential diagnoses of infections and porous, woven bone deposits caused by normal bone modelling in individuals under one year of age. Subadults were significantly more affected than adults (33.3% vs. 6.1%). Females were insignificantly more affected than males (13.8% vs. 0.0%). Neolithic villagers subsisting on intensive millet agriculture (3000-2000 BC, 21.4%) had the highest rate, while residents in small and major towns of the Western Zhou (1046-771 BC, 11.1%), Warring States (475-221 BC, 7.7%), and Han (202 BC-AD 220, 9.1%) periods were rarely affected. Biological (age or sex) and social (e.g., differential access to resources) risk factors, along with declined dietary diversity resulting from agricultural intensification, may have contributed to the occurrence of scurvy in Shaanxi during this time period.

Postcranial trauma in the Middle Holocene Cis-Baikal.

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In the Cis-Baikal region of Siberia, a rich middle Holocene (9000–3000 years BP) bioarchaeological record has provided a valuable resource for studying lifeways and cultural dynamics of northern foraging peoples. Over the last several decades, research has focused on populations lying on either side of a unique period of biocultural and climatic transition, those dating to the Early Neolithic (EN, ca. 7560–6660 cal. BP) and Late Neolithic-Early Bronze Age (LN-EBA, ca. 6050–3470 cal. BP), respectively. Several studies have demonstrated behavioral differences between the two groups, including increased mobility, activity levels, and population density during the EN. Here, we examine the prevalence and distribution of postcranial trauma to further explore the behavioural implications of cultural and climate transition in the Cis-Baikal. Accidental, occupational, and violent injuries were analyzed (by individual and skeletal element) for 184 EN and 162 LN-EBA post-pubescent individuals by estimated biological sex. Trauma prevalence was low overall (<1% by element and <20% by individual), particularly so for violent trauma (<2% by individual), results that are not dissimilar to other forager populations documented in the literature. Of the postcranial lesions identified, most (60–82%) were vertebral injuries consistent with occupational or habitual activities, including vertebral compression fractures, Schmorl's nodes, and

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spondylolysis. Vertebral trauma was significantly higher among EN individuals compared to their LN-EBA successors, and among males compared to females in both groups. Accidental trauma was similar among the two groups overall, but particularly low among LN-EBA females, possibly reflecting gender-based activity differences.

Lethal congenital defects: different expressions of anencephaly in infants from S. Domingos necropolis, Lisbon (17th-19th century).

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Any increased mortality risk due to congenital conditions for a fetus in utero becomes multiplied after birth due to exposure of the newborn to the extra-uterine environment. One of the most severe and lethal congenital diseases is anencephaly (prevalence of 5.1 per 10,000 births), a condition triggered by a malformation of the neural tube during gestation that results in a markedly underdeveloped brain mass and, consequently, in the absence of a cranial vault. Biomedical research reveals that individuals with anencephaly may present an array of cranial structural anomalies, emphasizing the importance of correctly diagnosing this condition. This work presents three possible cases of anencephaly identified in non-adults exhumed in the *S. Domingos* children's necropolis in Lisbon, Portugal (late 17th to early 19th centuries). The three individuals are fairly complete and well-preserved and were evaluated through macroscopic features and metric analysis. The age at death was estimated between 1.5 and 4.5 months based on dental calcification and eruption. They show an absence of the upper region of the skullcap characterized by different alterations of the cranial bones: premature fusion of pars lateralis with pars squama in one individual, and abnormal stages of development and shape of pars lateralis, sphenoid, petrous, temporal, zygomatic and frontal bone in the three individuals. With these examples, we intend to improve the recognition of anencephaly in archaeological contexts and contribute to the understanding of different ways of bone expressions within the same condition, aiming to complement the subject of rare diseases in paleopathology.

Detecting cribra orbitalia in post-mortem CT scans: implications for paleopathology.

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Post-mortem CT scanning (PMCT) is carried out at forensic medical departments prior to autopsy. Bones may be rendered in 3D based on PMCT. Thus, it becomes possible to correlate morphologic bone changes to autopsy reports and health data. This may have implications for paleopathology, as it becomes possible to apply modern medical data to analyze various paleopathological diagnoses based on dry bone morphology. We tested how cribra orbitalia (CO) may be detected on PMCT. In a pilot study 6 archaeological skulls of which 3 showed overt CO, were CT-scanned and analyzed in two steps: first the single slices were reviewed, and secondly a 3D visualization of the orbital roofs was reviewed. The latter reflects an analysis similar to dry bone appraisal. There was a 1:1 congruence between the CT images and morphoscopy. We then analyzed the orbital roof in PMCTs of 95 deceased, aged 5-25 years. We found that 33/95 were scored to have CO changes in the slice-by-slice analyses, while 20/95 were

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judged to have CO changes when analyzing the 3D renderings. Nineteen cases of CO were observed using both methods. Preliminary perusal of autopsy data indicates that at least 13 of these 19 cases had pathologic autopsy findings and/or a history of substance abuse. We conclude that the diagnosis of CO on non-dry bone skulls is not straightforward. A thin orbital roof may be misinterpreted as CO in slice-by-slice analyses, and conversely a 3D rendering may miss smaller porosities due to PMCT resolution constraints.

Investigating child abuse using bioarchaeological evidence: the potential of integrating finite element analysis into an interdisciplinary approach.

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The feasibility of identifying evidence of child abuse in the bioarchaeological record has been the subject of debate. This challenges bioarchaeologists to find novel ways to help recognise this phenomenon and its consequences in the past. But how can we render the abuse of children more visible, and its interpretation more reliable? This paper outlines a novel interdisciplinary approach that combines osteological and clinical evidence with radiological and bioengineering-modelling data to interpret these data within their historical, archaeological, psychological and socio-cultural context. The present study focuses particularly on the potential of bioengineering methods, specifically CT-based finite element analysis (FEA). FEA was used to re-evaluate a suspected case of child abuse, Užubaliai No. 10 (Lithuania, 16th–18th century AD), to demonstrate its potential to reveal the mechanisms of long-bone fractures by predicting the fracture pattern and bone failure load under a variety of loading scenarios. The modelling outcome for the injured femur indicated that the fracture mechanism required torsion at the hip, while fixing the bone at midshaft. This mechanism suggests a need for external intervention, such as grabbing and twisting the leg with force consistent with the strength of an adult. FEA investigation on ulna and humeral fractures is ongoing. Our analysis sheds light on the most likely fracture scenario and the likelihood of inflicted injuries, allowing for a critical evaluation of where the limitations lie. This study highlights how FEA can complement commonly recorded osteological data and improve our ability to support suspected cases of child abuse within the bioarchaeological context.

Evaluating risks of mortality for individuals with concurrent versus non-concurrent bilateral linear enamel hypoplasias in Postmedieval London.

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Linear enamel hypoplasias reflect periods of growth perturbation and recovery and are commonly employed in bioarchaeological studies as proxies for generalized childhood stress. The presence of LEH in bioarchaeological studies has correlated with both increased and decreased risk of mortality, which could be interpreted as both frailty and resilience, respectively. Furthermore, variability in mortality risk between individuals with unilateral versus bilateral LEH have yet to be scrutinized. This study examines bilateral LEH in mandibular canines from 90 adult individuals from 18th-19th century London skeletal samples (Chelsea Old Church, Cross Bones, St. Bride's Fleet Street, and St. Bride's Lower cemetery) to

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evaluate risks of death associated with concurrent versus non-concurrent LEH events. Concurrent LEH was defined as having bilateral LEH that developed at similar dental ages; non-concurrent LEH was defined as having bilateral LEH that developed at different dental ages. LEH data and adult age at death categories were derived from the Wellcome Osteological Research Database (WORD). Concurrent versus non-concurrent LEH was modeled as a covariate affecting the Gompertz model of mortality. Results show no significant difference in the risks of mortality faced by individuals with concurrent versus non-concurrent bilateral LEH. Interestingly, an analysis using known ages (St. Bride's Fleet Street sample) indicated a pattern of increased risk of death for individuals with concurrent bilateral LEH (p=0.0697). Overall, differences in mortality among individuals with bilateral LEH demonstrate how childhood stress events, severe or chronic enough to manifest as concurrent bilateral LEH, impacted risk of mortality in Postmedieval London.

Shadows of blood: diagnostic limits of hematologic malignancies informed from the Lisbon Identified Skeletal Collection, 20th century.

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Biological, sociocultural, and environmental factors are key causes affecting the contemporary burden of malignant neoplasms; however, the paleo-oncological landscape is still sparsely known. The present research aims to address paleopathological diagnostic features of hematologic neoplasms, a less common group of malignancies, through the integrated analysis of skeletal remains. Thus, this work hopes to contribute to advances on the diagnosis of hematologic malignant neoplastic diseases in past populations. The skeletal remains of 89 individuals with a malignant neoplasm recorded in the cause of death and belonging to the Museu Bocage (Lisbon) Identified Skeletal Collection, were evaluated macroscopically. This sample corresponds to 40.4% (n=36) of males and 59.6% (n=53) of females, with age-at-death ranging from 15 to 93 years, and death occurring in the early 20th century. Among these, four individuals (4.5%) had a hematologic neoplasm recorded in the cause of death as leukemia (n=3) and non-Hodgkins lymphoma (n=1), corresponding to three females and one male with age-at-death ranging from 15 to 66 years. The individuals with macroscopic lesions (n=3) did not markedly differ in the distribution pattern and typology from other cancer primaries in the sample. They exhibited mixed lesions (osteoblastic and osteolytic), a predominant moth-eaten margin, and reactive new bone formation. This work highlights the difficulty of differentiating between hematologic and malignant cancers of epithelial origin (carcinomas) in the skeletal remains from past populations.

The significance of the oroantral fistula for understanding the cause of maxillary sinusitis.

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This work evaluates the common assumption in paleopathology that a fistula connecting the oral cavity with the maxillary sinus is evidence for an odontogenic origin for maxillary sinusitis. Oroantral fistulae, created iatrogenically, are the prime cause of odontogenic sinusitis today. In the past, fistulae more likely arose due to bone resorption from slowly enlarging periapical granulomas/cysts. Clinically, in such cases, there is no direct oroantral communication, and although cyst walls potentially allow leakage of contents into the sinus, this is not always so. There may be no sinus infection even when lesions are advanced. Of

240 sinuses in 133 11th-14th century AD UK adult skeletons studied macroscopically, 14 sinuses in 13 individuals showed oroantral fistulae. All were associated with subadjacent periapical voids, supporting a slowly expanding granuloma/cyst as the cause. 5 of 14 sinuses showed no bony deposits in their basal antral surfaces. One showed woven bone, seven coarse pitting suggestive of remodelled inflammatory deposits; one showed only spicular bone. Results indicate that rarely was a fistula associated with active bony infection in the basal sinus; in most cases infection was absent or had resolved. Results are inconsistent with open fistulae as continuing sources of sinus infection. Oroantral fistulae are not always evidence for odontogenic sinusitis. Clinical literature indicates that if infection from diseased maxillary tooth sockets is to be transmitted to the sinus, this normally occurs through intact alveolar bone, long before any periapical lesions become large enough to perforate bone. Our palaeopathological observations are consistent with this.

Periodontitis prevalence and severity in Colonial Peru: a first approximation from Mórrope and Eten, Lambayeque Valley Complex (1535-1750 CE) .

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The 16th and 17th centuries in Peru were a period of extreme political and socioeconomic instability involving Spanish subjugation of Andean peoples. A growing number of paleopathological studies have begun characterizing the biocultural effects of conquest on the north coast of Peru; however, periodontal disease has remained virtually unstudied. Here, we provide the first characterization of periodontal disease severity in Colonial Peru to assess the magnitude of biological stress. We hypothesize that periodontal disease prevalence and severity was greater in the Colonial Muchik town of Mórrope (a setting of heightened economic and biological stress) compared to their Muchik neighbors to the south in Eten (an economically stable community). We used established protocols measuring CEJ-alveolar margin distances as a measure of periodontitis prevalence/absence and alveolar margin morphology/ porosity/recession to assess severity. Sixty-four adults from Mórrope and 115 adults from Eten were examined. Data were analyzed using odds-ratio (ÔR) analysis. A higher crude prevalence of periodontitis is observed in Eten (59% vs 36% in Mórrope, which was statistically significant (ÔR=0.38; p=0.01). A statistically significant difference of severity was not observed (ÔR=0.61; p=0.01). Severe expressions of periodontitis were observed in both samples (55% Mórrope and 44% Eten). We interpret these unexpected findings in the contexts of their archaeological settings, inflammatory disease biology, patterns of other oral pathological conditions, and isotopic variation to suggest that the extremely high rate of antemortem tooth loss and alveolar remodeling in Mórrope obscures straightforward comparisons between these communities, highlighting new questions and opportunities in studying periodontitis in historic Peru.

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Cranial and postcranial cribrous lesions in two early medieval non-adult skeletal collections from Thuringia, Germany.

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Cribrous skeletal lesions are common indicators of physiological stress, including nutritional deficiencies and infectious disease, and are used to assess those conditions in past populations. This study investigates cribrous lesion frequency among non-adult skeletal remains from two sites to test whether communities in Merovingian Thuringia show conformity or variability in burden and expression of disease. The sample consists of non-adults from two sites dating to the Merovingian Period (about 450-751 CE): Großvargula (n=14) and Bebra (n=10), ranging in age from <1 to 17 years old. Cranial lesions considered include cribra crania externa (CC) and cribra orbitalia (CO), while postcranial lesions (PCL) include cribra vertebralis, cribra humeri, and cribra femoralis. Lesions were assessed under 10x magnification; those appearing to be superficially deposited bone were excluded. Chi-square tests show significant differences in CC and CO frequency between sites (Fisher's exact $p<0.05$), driven by a lower occurrence of both conditions at Bebra (20% and 22% respectively) compared to Großvargula (64% and 69% respectively). There is no difference in the frequency of PCL between both sites (100%), as all PCL considered were present in all assessable individuals. The differences in CC and CO between sites indicate variability in the affliction with physiological stressors and potential frailty differences between close-by communities from the same period, contributing to a more varied picture of early medieval community health. The lack of variability in PCL prevents their use in assessing differential load of disease between these populations and raises questions regarding their etiology and utility in paleopathology.

A meta-analysis study of parasites in ancient Egypt and Nubia.

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Egypt and Nubia were ancient civilizations that developed along the River Nile in northeast Africa from around 5000 BCE. The arid climate leading to natural mummification, coupled with the cultural adoption of artificial mummification, has resulted in the preservation of an unusually broad range of material for the analysis of the parasites that infected those populations. The aim of this study is to improve our understanding of the prevalence of different species of parasites in order to evaluate their health impact upon the two populations. The method involved bringing together over a hundred publications on ancient parasites covering 3200 BCE – 600 CE for these societies, in order to interrogate the data at a population level using a meta-analysis approach. The results show that a range of important species of parasite were widespread in Egypt and Nubia. Schistosomiasis was found in up to 65% of mummies tested, head lice in 40%, malaria (*Plasmodium falciparum*) in 22%, and visceral leishmaniasis in 10%. Zoonotic parasites (that infect animals as well as humans) dominated. Unlike most other ancient civilizations, there was hardly any evidence for parasites spread by poor sanitation. This may be a consequence of the yearly Nile floods fertilizing agricultural land, so avoiding the need for farmers to apply animal and human faeces to the soil. Schistosomiasis and malaria cause profound chronic anaemia, which would have had a major impact upon the ability of the workforce to complete the major infrastructure projects for which ancient Egypt and Nubia are well known.

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Paleogenomic insights on tuberculosis from the laboratory of Robert Koch: comparing 19th century and modern genomes.

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From the 17th to 19th century, tuberculosis (TB) devastated Europe and America, claiming approximately a quarter of the population. Initially misconceived as a hereditary or lifestyle-related ailment, understanding shifted dramatically in 1882 when Robert Koch demonstrated *Mycobacterium tuberculosis* (Mtb) as the infectious agent behind TB. This breakthrough intensified TB research, reshaped societal perspectives, and catalyzed an urgent pursuit for the cure. Koch's own attempt for a cure, tuberculin, was unsuccessful but was later foundational to diagnostic tests. The advent of antibiotics, over fifty years later, revolutionized TB treatment, but intriguingly, a decline in TB cases is observed prior to antibiotic introduction. Here, we employed advanced paleogenomic methods to reconstruct *Mycobacterium tuberculosis* genomes from two historical samples from Koch's laboratory, a tuberculosis culture and tuberculin, yielding 59x and 3x fold genomes, respectively. Both samples offered an abundance of well-preserved Mtb DNA permitting high quality genomic reconstruction without targeted capture or chemical treatment of damaged sites. Phylogenetic analysis shows these genomes belong to the predominant group of *Mycobacterium tuberculosis* complex in America and Europe today, Lineage 4 (PGG3/L4.10). Comparative analysis of historical and modern genomes of Mtb reveals consistency in virulence, suggesting that the decline in mortality is independent of pathogen evolution. This study showcases the value of historical bacterial cultures as sources of ancient pathogen DNA for research aimed at understanding Mtb evolution within historical contexts. As datasets grow, we can better examine the interplay between the persistence or decline of TB, pathogen evolution, social contexts, and their reciprocal influences.

Health and environmental contaminants of Prehistoric Iberian communities: insights from ancient dental calculus analysis.

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The analysis of ancient dental calculus (mineralized dental plaque) has provided crucial insights concerning the lifeways of past human populations. Despite its potential to preserve diverse micro-debris, entrapped non-dietary particles are rarely discussed considering their potential to enlighten the health of past communities. This study aims to explore the non-dietary debris entrapped in dental calculus from two Portuguese Late Neolithic/Chalcolithic communities (4th-3rd millennia BCE), discussing their origins and impact on the health of ancient individuals from an interdisciplinary perspective, encompassing ethnography and medical research. Dental calculus (N=22) from Paimogo I and Cova da Moura collective burials were analyzed through optical light microscopy after accurate decontamination. Among the samples presenting non-dietary remains (90.0%; 18/22), 50.0% (9/18) contained microcharcoal/burnt debris, consisting mainly of soot-like residue. The soot-like residue (<2 µm) in the dental calculus can be due to accidental inhalation. It suggests the presence of smoke in the surrounding environment, which is harmful to the respiratory health. Evidence of flatworm parasites

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(Cestoda class) (2/22) was also found. These hazardous parasites were possibly ingested through contaminated food, revealing poor food hygiene. This hypothesis was also supported by the recovery of arbuscular mycorrhizal fungi (Glomeromycota phylum) (4/18). This work allowed the identification of ecological factors that could have harmfully impacted the respiratory and digestive systems of the West Iberian farming communities. Despite the challenge in the identification of the remains and their origin, these findings show the potential of dental calculus in addressing environmental and health-related questions that are not accessible through skeletal analysis.

Life and death in a provincial capital: paleopathology of the Late Roman period Salona (Solin, Croatia).

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Apart from being the capital of the Roman province of Dalmatia, the city of Salona (*Colonia Martia Iulia Salona*) was one of the largest and most important settlements in the eastern Adriatic during Late Antiquity. Despite its importance, we still do not know much about everyday lives and general health of the inhabitants of this provincial capital. Therefore, the present study aims to reconstruct paleodemographic and paleopathological characteristics of the people inhabiting *Salona* during this period. Recent archaeological excavations conducted on the territory of Vranjic, a Roman period *suburbium* of Salona, documented a cemetery dated to the 4th century CE. The inhumation burials include masonry tombs, lead sarcophagi, amphorae burials, and burials covered with *tegulae*. The total number of recovered skeletons is 48: 22 subadults, 17 adult males, eight adult females and one non-sexed adult with the highest recorded mortality between 2 and 5 years of life. Relatively high prevalence of subadult stress indicators (*cribra orbitalia*, porotic hyperostosis and linear enamel hypoplasia) and a presence of scurvy suggest poor subadult health. Additionally, numerous entheseal changes, as well, as a high prevalence of Schmorl's nodes indicate that most of the adults were physically very active. Skeletal injuries included cranial trauma, rib fractures and long-bone injuries, and most of these can be associated with accidents rather than intentional violence. The comparison with other Roman period skeletal assemblages from the region strongly suggests that life in Late Antiquity Salona was relatively peaceful and comparable to the quality of life in any other urban centre from Dalmatia.

External auditory exostosis: exploring environmental factors and prevalence in ancient southern South American populations.

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External auditory exostosis (EAE) is an abnormal bone growth in the external ear canal. Its presence has mainly been associated with exposure to cold water in past and current populations. However, temperature and wind chill were suggested as possibly related to EAE. Thus, our aim is to explore the presence of EAE in two skeletal samples of coastal and inland past hunter-gatherers from southern South America, and to discuss the possible influence of exposure to cold water. We studied adult skulls from

the Late Holocene period (2500-400 years BP): 25 from inland Central-Northern of Mendoza province, Argentina (CNM), without archaeological evidence of immersion in lakes, and 31 from the Atlantic coast of Southern Patagonia (SP). EAE was diagnosed when bony growths were recorded within the external auditory canal. Frequency, grade of occlusion, and laterality were determined, and compared between samples. Five skulls from CNM (20%) and 20 skulls from SP (64.5%) showed EAE, with statistically significant difference between groups. EAE was mostly bilateral (CNM=80%; SP=60%), of mild degree (CNM=60%; SP=75%). Males were more affected (CNM=80%; SP=75%), as were middle (SP=50%), and old (CNM=60%) adults. The frequency of EAE in coastal region suggests that immersion in cold water could have been a main trigger, while presence in the inland region suggests that this condition may be associated with combination of environmental factors, such as wind and low temperature. Further studies, including samples from other regions not related to cold water, could offer new insights into the factors involved in EAE.

Presence of pelvic features in biological mothers shown by genetic relatedness in early Medieval Austrian cemeteries (7th-9th c. CE).

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Reconstructing parity in skeletal series is a longstanding yet unfulfilled wish for anthropologists. In this study, we systematically recorded a set of at least four pelvic features of genetically sex-determined females to calculate the pelvic pattern index (PPI). This index, according to the method published by Pany-Kucera and colleagues has been shown to be >0.25 in women who have had two or more children in studies on historically documented skeletal collections. Genetic relatedness and descendancy across several generations were traced through extensive pedigrees mainly by genomic data from two Austrian early medieval cemeteries (Leobersdorf and Mödling An der Goldenen Stiege, in total n>600 skeletons). In both cemeteries more than 70 % of the individuals are related by 1st and 2nd degree. We found that among the 44 females where, based on at least four pelvic features, the PPI could be calculated, 39% had more than one child buried in the cemetery and of those, 30% also showed a PPI >0.25. Exceptions could indicate that women with pelvic features and no children or only one child buried in the site could have had children who migrated and/or were buried elsewhere. The percentage is in good accordance with previous analyses. With the calculation of the pelvic pattern index, at least a part of the multiparae can be traced in skeletal series without historical documentation on parity.

Thinking out of the casebook. 50 Years of case studies in paleopathology: a matter of how rather than what?

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This paper takes stock of the current debate about the contribution of case studies to paleopathological research and it outlines feasible solutions to maximize their impact. Publications over the last 15 years have addressed the issue of the efficacy of case studies in advancing the discipline`s progress. Some authors argue in favor of them, as they are crucial to generate new data, which in turn have the potential

to address new research questions; whereas others point out their purely descriptive approach and their lack of a problem-oriented structure, hence the missed opportunity for case studies to effectively meet the peer audience`s interests. Previously published bibliometric data are here framed into the economic and geopolitical context in which researchers preferentially opt for case studies. The outcome underlines how editorial solutions aimed to limit their number, independently from their scientific rigor, might inadvertently generate discriminatory access to main publication venues. This paper suggests that case studies require better tailored publishing solutions, steering authors toward Findable, Accessible, Interoperable and Reusable (FAIR) data, as well as new data management solutions, such as geo-referenced databases. Cascading advantages will affect population studies and problem-driven case studies, as they will benefit from gleaning more actionable data.

A case of gout on spontaneously mummified remains from Kėdainiai, Lithuania (17th-18th centuries AD).

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The exhumation and study of the remains of dignitaries of Kėdainiai, a historic town in central Lithuania, was conceived to explore, through a bioarchaeological approach, the life histories and health of a relatively large sample of mummified individuals from the upper social echelons entombed in a crypt at the Evangelical Reformed Church. The partially mummified, incomplete body of the person described in this paper was recovered along with 36 other preserved individuals. This adult male, whose external genitalia were still visible, was represented by only the lower part of the body, from the lumbar spine to the feet, with some soft tissue on the posterior side. The heads of the first and second right metatarsals and those of the first, second, and fourth left metatarsals showed lesions such as asymmetric resorptive lesions in the articular and para-articular tissues, as well as spicules of bone along the edges. Differential diagnosis considered seronegative spondyloarthropathies, osteoarthritis, and hallux valgus, with gout being the most likely explanation based on the resorptive lesions, sclerosis, and overhanging margins. This project is aimed at shedding light on the historical and cultural backgrounds of these elite individuals. The discovery of gout, clinically linked to a diet high in proteins and sugars, corresponds with the results from dietary isotopic, and radiologic data that this individual enjoyed a rich diet and abundant consumption of alcohol, which ultimately led to the consequences of this lifestyle.

How the Developmental Origins of Health and Disease (DOHaD) hypothesis can aid understanding of infant and maternal health in Iron Age and Roman Britain.

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The Developmental Origins of Health and Disease (DOHaD) hypothesis posits that palaeopathology can identify the impact of stress events on population health across multiple generations. Clinical and bioarchaeological research has attested that pre- and postnatal stress play an important role in immunity, morbidity, and mortality, moulding lived experiences of future offspring. Previous studies have examined

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non-adult skeletal remains, using palaeopathological indicators to propose how health insults arise from facing a poor socioeconomic environment during early development, yet limited studies exist comparing stressors with adult women from similar communities to detect a multi-generational impact. By viewing mothers and infants as interlinked, palaeopathologists can understand the long-lasting consequences of stress events. The health of Iron Age (4th century BCE-1st century CE) and Roman (1st-4th century CE) non-adults aged below 2.5 years (the first 1000 days after conception, n=444) from 25 sites across Britain were compared to women of childbearing age (20-45 years, n=277) from the same populations to identify how Roman occupation impacted health by reviewing similar stressors across individuals separated by centuries. Evidence for vitamin deficiency, infection, linear enamel hypoplasia, congenital defects and short stature/delayed growth were all considered as representing generational health insults. Results showed significantly higher levels (non-adults: χ^2=4.33 p=0.0374, females: χ^2=13.84 p=0.0002) of pathology in the non-adults (n=86/269, 32%) and females (n=95/160, 59%) living under Roman rule, compared to individuals from Iron Age Britian (non-adults: n=40/175, 23%; females: n=43/117, 37%) suggesting population health was negatively impacted. This demonstrates that DOHaD can provide insights on lasting generational health effects.

The ONE Paleopathology of Rio Zape, Mexico.

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La Cueva de los Muertos Chiquitos (600-800 CE), was occupied by the Loma San Gabriel people in present-day Rio Zape, Durango, Mexico. Although this cave site is inaccessible to canids, humans must have carried canids into the cave. Within the cave, on a 46 m2 surface, humans confined companion canids as shown by archaeology, CoproID and microbiome analysis of coprolites. Canid and human coprolites were excavated from the site. ELISA and microscopy revealed the largest number of pathogens ever found archaeologically. For helminths, 5 dog species, 3 human species, and 2 species infective to both hosts were found. In addition, there is circumstantial evidence in that human hookworms were present, potentially making 4 human parasites. By circumstantial, we mean that hookworm-type eggs have been found in samples that appear to have a human origin by molecular and CoproID analysis. Four of the dog parasites cause zoonotic diseases in humans. Our latest molecular study shows three protozoa and one fungal parasite infective to both hosts. Five intestinal viruses were found in human coprolites. Therefore, 19 parasites and pathogens were present in the cave. Beyond the direct evidence, the cave provides an ideal environment for the life cycle of *Trypanosoma cruzi* and raises the possibility that Chagas disease was a threat. This remarkable parasite association allows us to assess the health of humans closely associated with the health of companion animals in a shared environment. Thus, Rio Zape provides a microcosm that encapsulates, in one cave, the broad picture of canid-human ONE Paleopathology experience in the Americas.

An exploration of early life stress, socioeconomic status, and longevity in post-Medieval Netherlands.

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This paper examines the consequences of early life stress on an individual's age-at-death in two contemporary samples of varying socioeconomic status. I examine macroscopic linear enamel hypoplasia (LEH) and maximum femoral length (MFL) as indicators of early life stress events and compare these data to age-at-death. The two populations under study are high status Zwolle (1681-1828; *n*=46; young adult=11, late young adult=6, middle adult=20, old adult=9; females=29, males=17) and low status Arnhem (1626-1829; *n*=113; young adult=16, late young adult=25, middle adult=53, old adult=19; females=53, males=60,). Methods for sex age-at-death estimation include accepted osteological techniques (pelvic, cranial). LEH was recorded by tooth and a measurement from the cemento-enamel junction was taken for every insult. Results indicate that individuals with LEH are more likely to die young. However, the Arnhem population exhibits more frequent LEH insults per individual and insults extending throughout the lifecourse. MFL is not correlated with age-at-death in either population. Furthermore, there is no significant relationship between LEH status and MFL (*p*=0.495, F=0.474); although, the mean MFL was greater in the non-LEH sample than the LEH sample in both Arnhem and Zwolle (female x with LEH=423; female x without LEH=427; male x with LEH=457; male x without LEH=463). These results suggest survival of multiple physiological insults in the Arnhem population; however, this did not provide an advantage to increased longevity compared to other adult cohorts. MFL may not correlate with age-at-death or LEH status because of catch-up growth, selective mortality, or heterogeneity in frailty.

Migration and disease: exploring the lived experiences of a young adult female with paralytic poliomyelitis from the Bronze Age, Tell Abraq, United Arab Emirates (UAE).

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Paleopathology illuminates the complex interplay between migration, health, and mortality. I present a case-study of an 18-20-year-old female with paraplegia from Bronze Age (3200-2000 BCE) Tell Abraq, United Arab Emirates. Standard methods and radiographic imaging were used in differential diagnosis. Strontium and oxygen isotopic analysis were used to find patterns of residential mobility. Her lower limb bones were gracile and asymmetric, symptomatic of significant atrophy and growth disruption during development. She also exhibited raised and inflamed muscle ridges on both humeri radii, ulnae, and clavicles indicating stress from increased weight bearing on her arms. Differential diagnosis focused on childhood diseases that result in paralysis and influence limb asymmetry, mainly Cerebral Palsy (CP) and paralytic poliomyelitis. The biogeochemical results indicate that she migrated to Tell Abraq at approximately 15-years-old revealing that she moved to the site a few years before her death. CP is a neurological condition commonly caused by lack of oxygen to the brain during birth. While she exhibits several potential indicators of CP, her symptoms suggest a severe case making the move to Tell Abraq challenging. Poliomyelitis is a highly contagious virus and often contracted in infancy where it rarely results in paralysis. However, individuals who contract the disease later in life have a significantly higher chance of contracting the paralytic version of the virus. Paralytic poliomyelitis better matches her expressed symptoms and migratory status. I explore the potential for paleopathology to extend beyond

differential diagnosis to examine how individual identities intersect to elevate disease vulnerability and impairment.

ONE Health in the past: first molecular insights on medieval rodents as animal reservoirs for plague and leprosy.

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With the recent COVID-19 pandemic, the zoonotic potential of infectious diseases has received unparalleled attention within our modern societies. Concurrently, many diseases that have accompanied humans for thousands of years are re-emerging, making the integration of new perspectives such as ONE Health approaches necessary to enable their characterization, prediction and eradication. A key element in the evolution and persistence of zoonotic pathogens are animal reservoirs, which were so far largely omitted from most studies of diseases in the past. Here we are focusing on medieval and early modern rodent reservoirs and their connections to plague and leprosy using combined interdisciplinary methods (historical sources, paleopathology, ancient DNA, Next-Generation-Sequencing) in two studies. Firstly, we identified a black rat from an ossuarium in Gdansk (15th to 16th century) as an animal reservoir for plague via recovering a partial *Y. pestis* genome. Secondly, we reconstructed four medieval *M. leprae* genomes, including one from a red squirrel, from two archaeological sites in Winchester (10th to 14th century), a medieval English city, well-known for its leprosarium and its connections to fur trade. Our phylogenetic analysis revealed a closer relationship of the medieval squirrel strain to several medieval human strains than to modern red squirrel strains, indicating a yet undetected transmission in medieval times. In summary, our studies represent the first ONE Health approaches to past transmissions of leprosy and plague, which are centered around medieval animal reservoirs, and point to the future capability of such approaches to understand past and current zoonotic potentials of these diseases.

On the road to research of ONE Paleopathology in East Asia.

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Paleopathology and zooarchaeology are the studies of human and animal's health and disease conditions based on scientific analysis of the archaeologically obtained bones. Since animals and humans are constantly and closely influenced by each other in the process of evolutionary development, it is encouraging that there is an academic trend (ONE Paaleopathology) to analyze these two fields together to understand the health and disease of humans and animals at a more comprehensive level. Following this trend, research in South Korea has focused on the historical interaction between human and domesticated animals. Our research first deals with a look at how animal domestications originated, spread, and reached today's status in East Asia, and then, both human and domesticated animals have been simultaneously researched from the perspective of paleopathology. For instance, animal diseases spread to human beings as a zoonotic infection have developed into epidemics or pandemics that have killed countless people. In addition, livestock deaths due to infectious disease have led to periods of

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human famine, leading to starvation and death of many people. This close relationship between life, disease, and death of human beings and domesticated animals shows that only when analyzed together can we understand more accurately about human diseases in history.

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Changing health in North China's past populations: a preliminary paleodemographic and paleopathological investigation from Neolithic to Iron ages.

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An extensive review of bioarchaeological literature in modern day North China (data on 22,726 skeletonized individuals from 92 archaeological sites) served to characterize fluctuations in health and demography over time at this nexus of Central, Eastern, and Southeast Asian populations. Despite its critical significance in the development of modern populations and the vast dataset available, large-scale paleopathological investigations in North China are still in their early stages. In this preliminary study, the skulls of 511 individuals from 11 sites dating to Neolithic (8,000–1,800 BCE, n=3 sites/16 individuals), Bronze (2,100 BCE–8 CE, n=7sites/389 individuals), and Iron (c. 600 BCE, n=1 site/106 individuals) Ages were morphologically estimated for biological sex (adults only) and broadly categorized into age-at-death cohorts via dental development and attrition patterns. In addition, non-specific stress indicators of cribra orbitalia, porotic hyperostosis, linear enamel hypoplasia (LEH), periodontitis, and antemortem tooth loss (AMTL) were documented macroscopically to identify any initial, meaningful patterns in frequency across time periods. While the current sample is biased in size to the Bronze and Iron Ages, statistically significant increases in the rates of LEH (chi-square $p=0.039$) and periodontitis (chi-square $p<0.001$) were detected through time, but no other statistically significant results were identified for other pathologies or in conjunction with demographic profiles. Future initiatives in exploring changing health patterns in North China warrants future work especially within the contexts of environmental, cultural, and socioeconomic change. This project is supported by NSF grant #2040388 to Q. Wang and S. DeWitte.

Health and palaeopathology: more than just adding animals.

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Palaeopathology is embedded within integrative frameworks such as the biocultural approach which places emphasis on human-animal interactions, the broader environment, and their roles in human health. Given a disciplinary tendency towards ecological analyses, what does a ONE Health approach do and how and why should palaeopathology contribute? In this paper, we address these questions using our data and ideas from a study of malaria in Bahrain. The obvious answer is time depth, but beyond that, place-specific histories. Today, Bahrain's population has some of the highest prevalences of inherited haemoglobinopathies. This is often explained by short term causes (e.g., recent migration) or the ultimate explanation - agriculture. However, the palaeopathological record suggests that malaria

was introduced, waxed and waned, and that the genetic responses to it were selected for under different conditions. It is other lines of evidence, isotopic data of multiple species, climate histories, ecological modelling, historical records, aDNA and modern DNA that can provide us with a model of malaria over time. And why bother? If malaria is not present today in Bahrain, does the past matter? Palaeopathology can add two questions to ONE Health: what are the long-term aspects of lives and environments that create risk and exposure, and how is the way in which people conceive of the environment and animals productive of specific disease histories? Long-term, place-specific histories are important counters to grand narratives about disease, particularly zoonoses. But crucially, an anthropological approach means our contributions to ONE Health projects can extend beyond just adding time.

An individual with congenital orofacial defect from the Ming-Qing period Wenchi cemetery in Shanxi province (1368-1911 CE): First case of cleft lip and palate from archaeological settings in China.

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As a congenital defect, orofacial cleft, if untreated, can induce biological and social challenges such as lifelong difficulties in eating and speaking and possibilities of social marginalization and exclusion, in addition to the requirements of special care right after birth. However, based on historical texts, during the Ming-Qing Dynasties (1368-1911 CE) in China, individuals with visible disabilities or impairments were accommodated in society, and often surgical treatment was provided regardless of social standing within the institutionalized social care and welfare system. In this study, a 16 to18 year-old male individual with signs of congenital craniofacial anomalies from the Wenchi cemetery, northern China dating to the Ming-Qing Dynasties was investigated. Stages of epiphyseal union and tooth wear were used for age estimation, and pelvic morphology for sex estimation. Skeletal examination showed an abnormal right primary palate including the alveolar arch and abnormal bilateral secondary palates, in addition to a severe deviation of the nasal septum, suggesting congenital unilateral cleft lip and bilateral cleft palate. The individual has no evident skeletal markers of nutritional deficiency or physiological stress, and he was buried in the family cemetery with grave goods typical for the context. This suggests this individual was not neglected during growth and development and was not treated differently by mourners after their death. This is the first case of cleft lip and palate from archaeological settings in China, which not only enriches our knowledge of the history of congenital craniofacial anomalies, but also reflects the benevolent attitudes towards birth defects in ancient times.

Lessons from lesions: a ONE paleopathological approach to understanding entheseal change in elite horses from post-medieval England.

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The underlying anthropocentrism that often clouds paleopathological analysis in zooarchaeology can result in human-focused interpretations of lesions. Instead, animals should be considered from a 'posthuman' perspective that encourages different ways of thinking within a flattened ontology. The consideration of the complex interaction between biological, environmental and socio-cultural phenomena is fundamental to ONE Palaeopathology. Here, we interrogate a recurring entheseal change observed on post-medieval (late 17th/early 18th century) horse radii recovered from the elite landscape of Bradgate Park, Leicestershire, UK. The horses had been slaughtered and butchered for dog meat following their death, contrasting with their likely prestigious status in coaching, racing and/or hunting and significant investment in their upkeep. Many of the radii (26 out of 38) demonstrated substantial new bone formation with cortical remodeling at the attachment site of the accessory ligament for the superficial digital flexor tendon (AL-SDFT). Modern horses rarely display clinically significant injuries at this site, except for those involved in intense physical activity (e.g. racehorses and competitive sports horses). Metrical analysis showed that the length of new bone seen at the AL-SDFT entheseal site was greater than in a sample of modern horses and was sited more proximally, suggesting the Bradgate horses were subjected to repeated, intense physical activity imposing greater stress-loading on the AL-SDFT entheseal site than is seen in modern horses. This was likely to have been associated with significant recurring lameness in the Bradgate horses which could explain why they were slaughtered and used for dog meat.

Communicating paleopathological research to the public via artistic representation: experience as a participant in an artist-researcher collaboration.

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Communicating research to the public is an important part of the scientific process. Sharing paleopathological discoveries with non-scientists helps the community understand what we do and how we do it, promotes science and STEM education, fosters community engagement, creates advocates for our discipline, and conveys information that is often behind academic or publisher paywalls. That said, one of the major challenges of speaking to non-scientist audiences is using language that is approachable and free from technical jargon. A way to do this is through artistic representation. At UACOM-P, the Artist + Researcher (ARx) program pairs scientists with local artists to collaborate on translational pieces of art over the course of nine months. Upon completion, the public is invited to view the resulting work, where teams of researchers and artists use the artwork to educate the public about the research. This presentation will explain the ARx program, describe the experience of participating on an ARx team, and relate what was learned from the process. Moreover, it will showcase an artist's translation of paleopathological research in the Peruvian Andes. A beautifully executed suite of cloisonné jewelry pays homage to Moche metalwork, illustrates the process of conducting excavation and skeletal analysis in

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the Andes, and communicates paleopathological findings such as traumatic injuries, trepanation, and developmental conditions. Participating in this form of collaboration gives scientists an opportunity to enhance their ability to describe their research in clear language, so that artists can translate research for nonacademic audiences and provide a pathway for public engagement.

Occupational health in the Viceroyalty of Peru: a possible case of massive poisoning with mercury.

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This research addresses the health of people who worked in silver production at *haciendas minerales* in the central highland of Peru, during the 16th to 18th centuries. The technology of metal production at that time consisted of amalgamation using mercury, which resulted in the release of high quantities of this heavy metal into the environment. To quantify the possible impact of this toxic metal on mining production communities, a sample of 108 skeletonized individuals was macroscopically analyzed. These skeletons were found inside and outside of a viceroyalty-era Catholic chapel from viceroyalty times located in Hacienda Pucará, a metal production center located in the Partido de Huarochirí, east of Lima. These individuals displayed numerous malformations, (ranging from 2% to 21%, depending on the type of malformation and the population segment analyzed), both mild (such as block vertebrae) and severe (such as radio-ulnar synostosis), as well as blackish stained teeth typically seen in cases of mercury poisoning. These pathologies affected individuals of all sexes, ages, ancestries, and social *castas*. These findings highlight an aspect of history that is poorly known and has consequences for people still living in the environs of colonial mineral haciendas that remain contaminated today. This is also the case for illegal mining that still makes use of mercury in environments not previously contaminated. Knowing the impact of contamination on the health of past people can help to design public policies to improve health in the present.

From the High Seas to the Low Countries: a likely case of scurvy in a post-Medieval Dutch non-adult.

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Metabolic diseases has affected Dutch populations for centuries and is found frequently in the osteoarcheological record. However, the terminology used when assessing metabolic diseases such as scurvy is inconsistent and ambiguous, which can often make definitive diagnosis of this condition difficult. Therefore, this study applied the recommended diagnostic criteria outlined by Brickley and Morgan to diagnose scurvy in a post-medieval child (1650-1850 CE) demonstrating skeletal lesions suggestive of multiple metabolic disorders. While assessing metabolic diseases in an osteoarcheological context is notoriously difficult as multiple etiologies present similar lesions, the framework provided in Brickly and Morgan's method is ideal for this case because it takes not only the lesions into account but also the underlying biological mechanisms that lead to their presentation. The individual in question (4 ± 0.5 years) was recovered from a presumed high-status post-medieval cemetery in Delft, The Netherlands. Present lesions include bilateral and symmetrical porosity across the sphenoid bone as well as the palatine and zygomatic processes of the maxilla. Additional porotic lesions on the skull such as porotic hyperostosis and cribra orbitalia are indicative of impaired or defective mineralization associated with

vitamin deficiencies such as scurvy but have also been tied to a multitude of other etiologies including rickets and anemia. Through approaching this case using the diagnostic terminology outlined by Brickley and Morgan and avoiding the typical "tick-list" approach often applied to paleopathological analysis, this study will demonstrate the benefits of approaching metabolic lesions with consistent and standardized nomenclature.

'Hell for horses': equid health and human history.

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Versions of: 'Paris is paradise for women, purgatory for men, hell for horses' have been around since 1558. Although it summarizes the negative effects a domestic environment has had on one of the most influential animals in human history, such effects and their consequences have not been well studied. Purpose: to illustrate how a ONE Paleopathology approach incorporating historical, paleopathological, and veterinary knowledge can identify why equine morbidity and mortality occurred and their often-underappreciated broader impacts. Many equine diseases are unique to domestic environments and their incidence has changed with the demands of domestication. Although paleopathological evidence is often limited due to the paucity of horse remains, equine disease impacts are described in historical documents including census data, veterinary, agricultural, and military reports. Modern diagnostic case reports confirm the lesions, impacts and incidence of equine diseases in different domestic contexts. Crowding spread glanders, a major problem in cities and war, including Napoleon's invasion of Russia. In 1872 equine influenza paralyzed the US economy. Poor quality feed resulted in outbreaks of fibrous osteodystrophy in urban horses, while selenium poisoning was described by Marco Polo and likely contributed to Custer's 1876 defeat. Occupational diseases like quittor, caused by trauma to the feet, was common in draft horses but is rare today, while navicular disease was rarely described until the 1800s but is common today. Incorporation of historical evidence with knowledge of animal diseases in a ONE Paleopathology perspective identifies unappreciated connections between animal health and human history and better targets paleopathological investigations.

An interpretable machine learning model to predict age-at-death from a single radiograph of any large bone from archaeological contexts.

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The few studies that have applied AI to assess human remains have focused on sex identification and/or stature prediction. We sought to develop AI models for age-at-death predictions for archaeological remains, as establishing age-at-death is important for differential diagnosis of lesions in paleopathology. Using 693 radiographs from 136 adults interred in lead coffins in the crypt of St. Bride's Church, UK, in the eighteenth and nineteenth centuries, of known age-at-death, we constructed a convolutional neural network to predict age-at-death. Performance was assessed using leave-one-out cross validation, where the skeletal remains of one individual were withheld for testing (n = 136 training/testing sets). We

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generated an age-at-death prediction for each bone/radiograph and using all bones/radiographs (femora, tibiae, pelves, crania, humeri). Using back-propagation, we generated heatmaps that localize relevant regions of the skeletal remains that are most important to the model in predicting the age-at-death. Our models can predict the decade-of-death with an accuracy of 94% when able to leverage all available bones, decreasing to 82% when assessing performance using a single bone/radiograph (irrespective of quality/completeness). We observed performance variation by bone, suggesting different degrees of informativeness. Heatmaps highlighted bone regions important for prediction (long bone diaphyses), which correlated well with some features used in established methods for age estimation and highlighted new avenues for exploration. Our finding that AI can accurately predict age-at-death from a single (incomplete) radiograph of any large bone demonstrates its potential as a support tool for paleopathological analysis. Future work will assess generalizability to other archaeological contexts.

Pathogens between the seas: paleoecological and human historical co-production of Chagas' disease and American cutaneous leishmaniasis in Panama.

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Dominant contemporary narratives of environmental change and zoonotic disease transmission are often limited to proximate ecological mechanisms such as deforestation or climate-induced alterations in host or vector community structure and dynamics. Other frameworks are organized around blaming today's most vulnerable populations, particularly how the poor or Indigenous live or use their plots of land. Both approaches hinder our understanding of how and why zoonotic diseases turn endemic. In this study, we begin to integrate phylogeographical, palaeoecological, and human historical analyses to understand the contemporary epidemiologies of two vector-borne zoonotic pathogens endemic to Panama--Chagas disease (CD) and American Cutaneous Leishmaniasis (ACL). We review the deep genetic structures of CD, ACL, and their vectors in the Panamanian Isthmus and outline regional human-animal-vector-pathogen relationships from their Permian origins to precolonial times and modern-day neoliberal globalization. We propose interpenetrating historical processes across temporal scale converged to create contemporary ecological conditions favoring persistence and increased transmission of the two parasites: from the path dependencies set by eon-shifting pathogen-vector ecologies to the trade practices of precolonial imperium and the land use practices of colonial latifundia and transnational agriculture and mining. In addressing the multi-host coevolution of the two pathogens across their paleoecological origins, multiple human histories, and the relationships their molecular and evolutionary ecologies share with local, regional, and global economic and sociopolitical activities, we aim to better identify the multifactorial interventions needed to reduce their burden.

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Evaluating risks of mortality for individuals with unilateral versus bilateral linear enamel hypoplasias in Postmedieval London.

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The Developmental Origins of Health and Disease (DOHaD) framework considers how early life stress influences later life health outcomes, and bioarchaeologists utilize skeletal indicators of stress to investigate the downstream effects of stress events that occurred during the developmental period. Though the presence of linear enamel hypoplasia (LEH) is often incorporated into bioarchaeological studies of DOHaD and frailty (i.e., variation in the risks of mortality among members of a population), the potential for LEH to contribute additional information about heterogeneous frailty is rarely considered. This study uses canine LEH data from 144 adult individuals in five 18th-19th century London skeletal samples (Chelsea Old Church, Cross Bones, St. Bride's Fleet Street, and St. Bride's Lower cemetery) recorded in the Wellcome Osteological Research Database (WORD) to assess risk of death associated with unilateral versus bilateral LEH. Unilateral or bilateral LEH was modeled as a covariate affecting the Gompertz model of mortality. When using WORD adult age categories, results indicated no significant increased or decreased risk of death between individuals with bilateral LEH and unilateral LEH. Lack of a difference in risk of mortality between these individuals may indicate a limited or indiscernible impact on frailty created by subsequent LEH-forming stress events beyond the initial physiological insult. However, as analyses with known ages at death (St. Bride's Fleet Street sample) yielded significant differences, future comparisons of unilateral and bilateral LEH may benefit from age point estimates (e.g., transition analysis) for a more nuanced understanding of the effects of early life stress.

Two probable cases of syphilis during the Qing Dynasty (1644-1912 CE) in Shanxi, China.

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Treponemal disease is a communicable disease caused by subspecies of the bacterium Treponema pallidum. It has been widely reported in archaeological skeletal remains, but syphilis in juveniles is observed less in ancient populations. This paper describes a 15-18-year-old male (M30 and a 13-15-year-old female (M31) skeleton potentially with bone changes of treponemal disease buried in the Shunxiang, Hongtong, Shanxi Province (Qing Dynasty;1644-1912 CE).Skeletal remains of the two individuals were examined macroscopically and radiologically. Superficial shallow destructive lesions of the cranium show sclerotic healing. Ribs, humeri, ulnas, radii, femurs, tibias, and fibulae exhibit multiple lytic and proliferative lesions and both tibias demonstrate irregular cortical thickening with characteristic saber morphology. These lesion characteristics are consistent with treponemal infections. Considering that strains of yaws and bejel mostly occur in the tropics or in hot, dry environments, which differs from the climate of Shanxi, venereal syphilis was considered the most likely diagnosis, but the first two are not completely ruled out. Treponemal disease has rarely been recorded in ancient Chinese skeletons. This finding adds new evidence of treponemal disease in ancient China and further enriches our understanding of its skeletal manifestations. However, in adolescents, it is difficult to distinguish between late stage congenital and venereal syphilis without clinical data. Therefore, future research

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aims to further confirm the genetic relationship between the two individuals through molecular detection, which will provide insights for diagnosis of congenital or venereal syphilis.

An archaeoparasitology study from southwestern China: first-ever-attempted case study from a Bronze-Age Yunnan site (17th – 3rd Century BCE).

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The Yunnan Province, situated in the southwest of China, boasts a rich historical and cultural heritage. Archaeoparasitology has been infrequently conducted in the region. To address this gap, we initiated archaeoparasitological studies in Yunnan, focusing on the Jinning Gucheng Village Site. We collected forty-six soil samples from abdominal and head regions of human skeletal remains at this site. Radiocarbon dating revealed the site's occupation spanned from 3600 to 2500 years BP, aligning with the Shang and Zhou Dynasties in the Central Plains. 0.2 grams of each soil sample was weighed, rehydrated, and microsieved. The sieved sediments were centrifuged and made into slides ready for observation under a digital light microscope. Within two soil samples, we identified remains of parasitic eggs exhibiting characteristics consistent with roundworm (Ascaris sp.)—oval shape, clear coat structure, and sizes of 64µm long x 44µm wide and 63µm long x 46 µm wide. Roundworm infections typically result from the consumption of raw or undercooked meat, poor hygiene, and exposure to nightsoil. However, increased water drainage provided by the site's significant shell accumulations and the percolation effects of underground water flow may impact truly assessing parasite abundance at the site. Despite these considerations, as roundworm infections persist in contemporary Yunnan, ongoing examinations aim to elucidate the parasitic status in this site. It is of great value to continue archaeoparasitological studies in Yunnan archaeological contexts.

Multiple osteochondromas in a Qing period individual from Shandong, China.

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Discoveries of multiple osteochondromas in one individual have been rarely found in human remains excavated from archaeological sites. This study presents an individual (M6) aged 40-45 years from the Bailizhuang cemetery of Qing Dynasty (1616-1911 CE), Weifang, Shandong Province, who displayed multiple bony growths on the skeleton. The diagnosis was made by macroscopic observation of the skeleton, the use of modern medical diagnostic indicators, and the assistance of radiological techniques. The results demonstrate that the individual had multiple hyperplastic bony growths, short stature, asymmetric length of the upper limb bones, fusion of the proximal tibia-fibula, mild knee deformity, and asymmetric left and right hips. Radiographic evidence shows that the bony growths on the skeleton do not have clear boundaries, and that the most probable diagnosis is multiple osteochondromas. This is the first possible reported case of multiple osteochondroma in an adult in Chinese bioarchaeology, which helps to expand paleopathological data on benign tumors as well as to fill the gap of relevant ancient cases in Asia.

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Ancient pathogens, microbes, and ONE Health: using paleogenomics and paleopathology to inform our understanding of present-day infectious disease risks within the ONE Paleopathology paradigm.

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When translational science is united with the emergent ONE Paleopathology paradigm, which is inspired by ONE Health, and integrated with ancient -omics and paleopathology, findings can be used to inform pandemic preparedness and clinical and public health responses to contemporary infectious disease risks of epidemiological concern. This is because ONE Paleopathology explicitly integrates identification of past host-environment-animal-plant-pathogen (HEAPP) interactions into assessments of past infectious disease dynamics and burdens. The zoonotic origins of most emerging infectious diseases (EIDs) remind us that, following uniformitarian principles and epidemiologic transition theory, focusing primarily on the human aspect of past infectious diseases may exclude and obfuscate many of these diseases' potential sources, exposure risks, and transmission pathways. The incorporation of various data sources and types needed in ONE Paleopathology, however, involves several methodological complications. These include the limited sensitivity of skeletal tissue to acute infections and material complexities in identifying skeletal and archaeological evidence of past HEAPP interactions and their potential outcomes of epidemics and pandemics. They also include material complications in recovery and identification of bacterial and viral genetic sequences from human as well as archaeological and museum curated substrates. Grounded in short, original historical case studies (e.g., 19th – early 20th century North American animal oral microbiomes and avian influenza), we discuss several of these complications. We also suggest possible pathways for accommodating and circumventing them. This may facilitate further integration of findings from paleopathology, paleoepidemiology, and ancient-omics into ONE Paleopathology and through translational science, their application to clinical medicine and public health.

Bipartite patella and vastus notch: an examination of prevalence and etiological factors in late Holocene human skeletons from southern Patagonia, Argentina.

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This study investigates bipartite patella (BP) prevalence and its potential causes in Late Holocene human skeletal remains (approximately 3500-200 years BP) from Southern Patagonia (Argentina), comprising terrestrial-mixed and maritime hunter-gatherer populations. It also explores the significance of the vastus notch (VN) as a potential indicator of changes in physical activity patterns. The sample includes 36 patellae from 22 adult individuals (15 males, 7 females; 13 young adults, 9 middle adults). Patellae were examined for morphology and concavity roughness. BP was diagnosed based on irregular and rough concavities in the margins, classified as Type I, II, or III. VN was identified by smooth concavity margins. Data analysis considered age, sex, and geographic subregions (Santa Cruz/Magellan, northern Tierra del Fuego and southern Tierra del Fuego). Only BP Type III was recorded, which affected 13.6% of skeletal remains, all male individuals from Tierra del Fuego with terrestrial-mixed and maritime

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subsistence. VN was detected in 22.7% of individuals, with a preponderance among the female population. Notably, the occurrence of VN was uniformly distributed across subregions, and not correlated with BP. Type III may result from developmental defects influenced subsequently by trauma and mechanical loading. In contrast, VN could be associated with biomechanical overloading and postural demands. Geographical provenance suggests that BP was more frequent in terrestrial and mixed hunter-gatherers than in maritime populations from Southern Patagonia, while no differences were found for VN among economic strategies, highlighting the variability in the development of these conditions across diverse populations within the region during the Late Holocene period.