NO PREP

What Bones Can Tell Us

Reading the Human Skeleton

Includes: Student reading, case study, differentiated questions, teacher key

Name: Period: Date:

What Bones Can Tell Us: Reading the Human Skeleton

The Skeleton as a Life Story

Every human skeleton is a biography written in calcium and collagen. Unlike a written record, which can be lost, forged, or never created in the first place, bones carry information about a person's life regardless of whether anyone intended to preserve it. The shape of joints, the density of long bones, the wear on teeth, the healed fractures in a wrist — all of these are permanent records of how a person lived, what they ate, what injuries they survived, and how their body aged. Bioarchaeologists and forensic anthropologists have developed sophisticated methods for reading these records, turning anonymous skeletons into detailed life histories. The scientific discipline that underlies this work is osteology — the study of bones. Osteologists understand how the skeleton develops from birth through old age, how disease and trauma alter bone

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Age, Sex, and Stature: The Biological Profile

The first task when examining an unknown skeleton is constructing a biological profile, a set of basic descriptors that narrow down who this person was. Estimating age at death is one of the most reliable assessments osteologists make. In children and adolescents, the timing of tooth eruption and the fusion of growth plates at the ends of long bones follow predictable developmental schedules. A skeleton with all its growth plates still open and primary teeth present almost certainly belonged to a young child. By contrast, in adults, age estimation becomes less precise and relies on degenerative changes: wear on joint surfaces, changes in the density of the pubic

symphysis (where the two halves of the pelvis meet), and the degree of fusion of cranial sutures. Estimating biological sex from skeletal remains is most reliable from the pelvis and skull. The female pelvis evolved to accommodate childbirth and has a wider, more open shape than the male pelvis. The male skull tends to have more pronounced brow ridges, a larger mastoid process behind the ear, and a more angular jaw. These differences are reliable in adults but less so in children, whose skeletons have not yet developed sexually dimorphic features. Stature can be estimated from the length of long bones (particularly the femur and tibia) using population-specific regression formulas that account for the relationship between limb length and overall height.

Markers of Hard Work and Hard Times

Beyond the basic biological profile, bones record the texture of a life. Enthesopathies are bony projections or roughened areas that develop where muscles and tendons attach to bone. They grow more pronounced with heavy, repetitive use. A medieval laborer who spent decades carrying loads would develop dramatically different enthesopathies than a scribe who spent the same years sitting at a desk. By mapping these markers across a skeleton, bioarchaeologists can make educated inferences about the physical demands of an individual's occupation. Nutrition leaves its mark on bones as well. Episodes of malnutrition during childhood cause horizontal lines to form in the dense cortex of long bones, visible on X-rays as Harris lines. Severe vitamin D deficiency produces rickets, a condition that bows the leg bones and deforms the pelvis. Scurvy, caused by vitamin C deficiency, leaves characteristic lesions on the surface of bones where blood vessels ruptured. Anemia can cause the skull's outer table to become porous and pitted, a condition called porotic hyperostosis. Together, these markers allow researchers to reconstruct not just an individual's diet, but the food security of entire ancient communities.

Trauma, Disease, and Cause of Death

Bone preserves evidence of trauma with remarkable fidelity. Fractures leave permanent signatures even after they heal — and whether a fracture healed at all is itself informative. A healed fracture means the individual survived the injury and lived long enough for bone remodeling to occur. An unhealed fracture at or near the time of death may indicate the injury was fatal or occurred in the final days of life. The angle, location, and characteristics of a fracture can help distinguish accidental

injuries from deliberate violence. Sharp force trauma — from blades — leaves clean cuts in bone. Blunt force trauma produces crushing and radiating fracture patterns. Projectile trauma leaves entry and sometimes exit wounds in bone. Many diseases also leave traces in bone. Tuberculosis can cause the vertebrae to collapse in a characteristic pattern called Pott's disease. Syphilis produces distinctive lesions on the skull and long bones. Leprosy attacks the nasal bones and the small bones of the hands and feet. Cancer can spread to bone, leaving erosive lesions or abnormal growths. Not every disease kills quickly enough to affect bone — many soft tissue diseases leave no skeletal trace at all — which means the bioarchaeological record of ancient disease is incomplete but still illuminating. Understanding what conditions do and do not appear in the skeletal record is as important as knowing what does.

Key Information: Reading the Human Skeleton

Skeletal Feature / Indicator	What It Reveals
Growth plate fusion	Age at death in adolescents and young adults
Pubic symphysis surface texture	Age estimation in adults (becomes more irregular with age)
Pelvic shape	Biological sex — female pelvis wider and more open for childbirth
Skull morphology (brow ridges, jaw)	Biological sex — male features more pronounced
Long bone length (femur, tibia)	Estimated stature using population-specific formulas
Enthesopathies	Muscle attachment stress markers — reveal repetitive labor patterns
Harris lines (X-ray)	Horizontal lines in long bones indicating childhood malnutrition episodes
Porotic hyperostosis	Porous skull surface indicating anemia, often linked to diet or disease

Skeletal Feature / Indicator	What It Reveals
Fracture patterns	Trauma type: healed fractures = survived injury; sharp/blunt force distinguishable
Vertebral collapse (Pott's disease)	Evidence of tuberculosis infection

Case Study: The York Skeleton

Dr. Elena Vasquez has been working the York medieval cemetery project for three field seasons, but skeleton YK-247 is the one she keeps coming back to. On paper, YK-247 is unremarkable: an adult, probably male, buried without grave goods in the north section of the churchyard — the part historically reserved for the poor. But the bones tell a more complicated story. The teeth show evidence of professional dental repair, the kind of work that cost money in 14th-century England. The enamel hypoplasias on those same teeth, though, indicate at least two episodes of severe childhood malnutrition, the kind that comes from genuine food insecurity, not a missed meal. The spine is the most telling. YK-247's lumbar vertebrae show severe compression and arthritic changes that Elena associates with decades of carrying heavy loads. The enthesopathies on the shoulder and upper arm bones are extreme — whatever this man did for work, he did it with his whole body, for most of his life. 'He had money for dental work at some point,' Elena tells her graduate student during the lab session. 'But he worked like a laborer his whole life. And he was malnourished as a child.' She pauses, looking at the dental work under the magnifying glass. 'What does that combination tell you?' The student doesn't have an answer yet. But Elena knows the bones are asking her to construct a life story that doesn't fit any simple category — and that is exactly what makes bioarchaeology worth doing.

1. Using specific details from the case study and the reading passage, explain what the combination of dental work, malnutrition markers, and labor enthesopathies in skeleton YK-247 might suggest about this person's life.

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2. Why is it important for bioarchaeologists to look at multiple skeletal indicators together rather than drawing conclusions from a single marker?

Multiple Choice

1. What are Harris lines, and what do they indicate?

    a) Growth plate scars that show when a person reached full adult height during skeletal development

    b) Horizontal lines in long bones visible on X-rays that indicate childhood malnutrition episodes

    c) Striations on tooth enamel caused by vitamin C deficiency

    d) Marks on the skull caused by blunt force trauma

2. Which skeletal feature is most reliable for estimating biological sex in adults?

    a) The number of teeth present

    b) The length of the femur

    c) The density of the cranial bones

    d) The shape of the pelvis

3. What does it mean when a skeleton shows a fracture that has fully healed?

a) The individual survived the injury and lived long enough for bone remodeling

b) The injury was deliberately inflicted by another person

c) The fracture was caused by the burial process rather than trauma during life

d) The fracture occurred after the person died

Matching

Write the letter of the correct definition on the line next to each term.

Term	Definition
1. ___ Osteology	A) Physical injury to the body, such as fractures or cuts, visible in skeletal remains
2. ___ Skeletal markers	B) Scientific study of the structure and properties of bones
3. ___ Pathology	C) Biological differences in bone structure between males and females
4. ___ Trauma	D) Disease or abnormal condition that alters the structure of bone
5. ___ Sexual dimorphism	E) Physical signs preserved in bone that reflect health, labor, or life history

Fill-in-the-Blank

1. The scientific study of bones is called _____.

2. Horizontal lines in long bones visible on X-rays, caused by childhood malnutrition, are called _____ lines.

3. Bony projections that develop at muscle and tendon attachment sites due to heavy repetitive labor are called _____.

Short Answer

Answer each question in 2-4 complete sentences.

1. What can a bioarchaeologist determine from skeletal remains alone, and what are the limits of that analysis?

2. How might the skeleton of a medieval laborer look different from the skeleton of a medieval noble, and what biological processes cause those differences?

3. Why is it significant when a skeleton shows evidence of both trauma and healing — and what does an unhealed fracture suggest by comparison?