THE GLOBAL HISTORY OF HEALTH PROJECT

DATA COLLECTION CODEBOOK

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I. INTRODUCTION

This data collection codebook for the Global History of Health Project (GHHP) helps to document and analyze health (chronic morbidity, but under some conditions, also life tables) in various populations around the globe from the late Paleolithic to the twentieth century. Although adapted from an earlier version created for the Western Hemisphere Project (Steckel and Rose, 2002), our trans-Atlantic collaborative team has made numerous updates and extensions. Various publications describe most of the codebook variables (Ferembach et al. 1977; Workshop of European Anthropologists 1980; Larsen 1997; or Buikstra and Ubelaker 1994). We recently developed laptop-based software to standardize and improve the efficiency of collecting evidence following this codebook.

The project will archive the skeletal data collected by the protocol in a central database, which we will augment with information from archaeological context, historical documents (where available) and local ecology. Project members will use these data for a broad range of studies including the relationship of health to the natural environment, diet, social status, and habitual activity patterns. In addition, we plan to investigate the health of women and children, patterns of trauma and violence, and the co-evolution of humans and pathogens.

The software records lesions indicative of diseases such as rickets, scurvy, tuberculosis, leprosy, and treponematosis, which had an enormous impact on the morbidity and mortality of historic and pre-historic populations. Although the diagnosis of these conditions is often straightforward, additional study using a variety of more definitive diagnostic techniques may be necessary to determine the precise disease that afflicted an individual. Thus, our methods note these individuals for possible further study using radiography, histology, biochemical testing, and so forth. A photographic record will be made of specific conditions, and these will be included in the data record.

NOTE ON SOFTWARE: Researchers are encouraged to make comments or otherwise provide additional detail on any question in the survey, especially in situations where diagnosis is not clear-cut or the scoring of a lesion falls between two or more categories. To add a comment, simply click on the comment icon near the top of the screen and a text box will open (limit 256 characters).

II. IDENTIFICATION

SKELETON SCREEN AND CASE ID

At the beginning of each data collection session the "skeleton screen" appears. Select "Start New Case" if you are beginning a new skeleton. If continuing work on a skeleton, please select "Continue Case" and select the appropriate Case ID. As you begin to work on a new skeleton, the software will issue a Case ID number (same as PSI number—see below), which is composed of 4 parts that uniquely identify each skeleton. The first part is your personal ID, which the project web page issues, and which project staff must activate before you can obtain a site ID. Note that the screen partially truncates (on the right) the Case ID numbers of continued cases.

DATE AND TIME CONFIRMATION

Before opening the software, please check that the time and date displayed at the bottom of the computer screen is properly set to local time. If the date and/or time are incorrect, please reset them on your computer by double-clicking on the time display at the bottom of the screen. This time/date stamp helps to identify each skeleton, and to be accurate in data collection, the time and date must be set before opening the bone survey icon.

INVESTIGATOR

This field will contain the first initial and the last name of the person who codes the skeleton, and is useful for helping to clean and maintain the database.

SITE-SPECIFIC COLLECTION IDENTIFICATION NUMBER

The skeletal material studied will typically come from a site or collection containing the remains of many individuals. The project web page issues a site ID after the participant complete a form that briefly describes the site. The site-specific identification number is part of a sequence of numbers that uniquely identifies each skeleton studied in the project.

CURATION FACILITY IDENTIFICATION INFORMATION

Record here any identification information for the skeleton that is specific to the curation facility, such as alphanumeric data found on the box or bag where the skeleton is stored. Recording this information will assist the researcher in locating the skeleton for additional data collection in the future, should it be necessary. In situations where there is no curation facility information to record, please consult museum staff or otherwise create a short but unique alphanumeric code for identification purposes and label the box or bag accordingly.

PROJECT SKELETON IDENTIFICATION NUMBER

After entering a personal ID, site ID, and the curation facility identification, the software combines these with a laptop-generated 13-digit time date stamp to create the Project Skeleton Identification (PSI) or Case number, which is displayed in the upper right-hand corner of the screen. Each researcher should record this number in their personal logbook, which will be useful for many project applications, as explained in the document on instructions for laptop use.

III. PRE-INVENTORY

PRE-INVENTORY QUESTIONS

We designed the software to minimize the number of questions encountered by a user. The software applies a series of filters designed to eliminate unnecessary or irrelevant responses. **If you observe any diagnostic element, record the bone as "present," taking into account exfoliation and other surface damage that effectively prevents diagnosis.**

One section of the survey asks observers to indicate the percent of bone present for the proximal, distal and shaft portions of each post-cranial element. The latter includes the diaphysis and both metaphyses, and similarly the proximal and distal portions include the epiphyses. We use these

questions only for measuring the frequency of osteoperiostitis and fractures (the inventory provides the denominator or the amount of bone material at risk for these lesions). If a section of bone exists but is exfoliated or otherwise damaged, then it is not "present" for these diagnoses. Mark the inventory according to the percent of bone that exists and is not exfoliated, and thus available for observing these lesions.

First, display the skeleton in anatomical position.

1) Designate the individual as an adult, subadult, or neonate, which determines a fundamental pathway for the remainder of the data collection process. For example, if the individual is a neonate, no questions regarding sex estimation, molar wear, or degenerative joint disease will be encountered. Subadults will not encounter questions on DJD or long-bone metrics (with the exception of femur diaphysis length). Establishing the age boundaries between these groups is partly a judgment call. The software allows neonates to be aged 3 months prior to birth to 3 months after birth, while subadults can be as young as 0.00 and as old as 22.99 years (the upper limit could apply to very slow-maturing, poorly nourished men). Classify as an adult, with a minimum allowable of 14.00 (which could apply to precocious, well-nourished girls), if the epiphyses of the femur are fused, or in the absence of the femur, if the epiphyses of the humerus are fused. If neither bone is available, make the determination based on other features of maturity such as dental development or epiphyseal fusion of other bones, and explain your choice in a comment If the femur (or in its absence, the humerus) is fused and dental development is not complete, please indicate the stage of dental development in a comment. Remember that the choice affects branching in the software, not estimation of summary age, which may depend upon several indicators of maturity. Adults (but not subadults) receive questions on sex estimation, DJD and long-bone metrics, whereas subadults but not adults receive questions on dental development. Explain more complex patterns in a comment. If you have strong reason to believe that a subadult is 23 years or older, score the age as 22.99 and add a comment to the summary age question. Similarly comment if you believe an adult is under age 14.

2) Select the broad categories of skeletal elements present: cranial (including any cranial vault or facial elements); post-cranial remains; and/or teeth.

3) If the cranium is present, score the presence of facial bones (zygomatica, nasal, sphenoid, lacrimal, ethmoid), mandible, maxilla, or cranial vault (frontal, parietal, temporal, occipital).

4) Record any post-cranial remains, and score the right and left elements separately. For the vertebral column, record the number of vertebrae present in each category (cervical, thoracic, and lumbar). Record the presence of unsided elements including the sternum, sacrum, and coccyx.

5) Please record the approximate percentage (%) of the cranial vault present.

IV. CRANIAL MORPHOLOGY

CRANIAL MORPHOLOGY

For adults, the following sexually dimorphic cranial traits are scored with reference to Figures 1-5: nuchal crest, mastoid process, prominence of glabella, supraorbital margin, and mental eminence. Score each trait independently, ignoring other features. Specific procedures for each trait are listed below. The most extreme forms of each feature are defined here, with intermediate grades illustrated visually in Figures 1-5 .

Nuchal Crest: View the lateral profile of the occipital and compare it with the diagrams. Feel the surface of the occipital at the midline with your hand and note any surface rugosity, ignoring the contour of the underlying bone. Focus upon the rugosity attendant to attachment of nuchal musculature. In the case of minimal expression (score = "1"), the external surface of the occipital is smooth with no bony projections visible when the lateral profile is viewed. Maximal expression (score = "5") defines a massive nuchal crest that projects a considerable distance from the bone and forms a well-defined bony ledge or "hook."

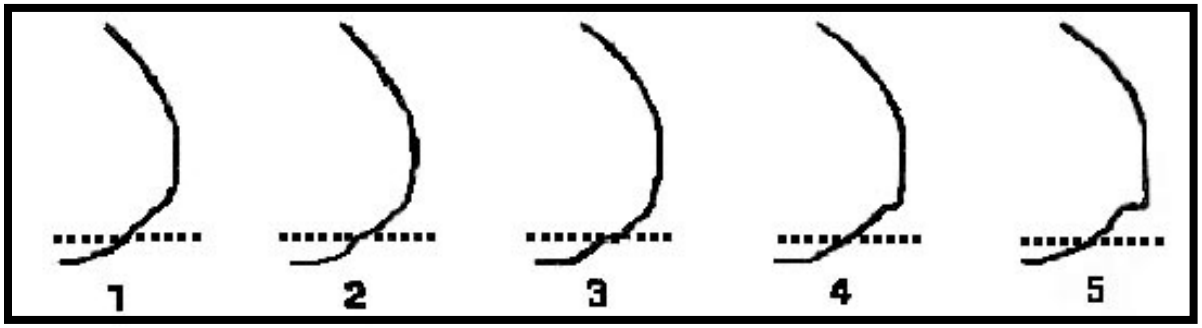

Figure 1: Standard for scoring the nuchal crest. Unobservable traits receive a score of "0" (after Acsadi and Nemeskeri, 1970).

Mastoid Process: Score this feature by comparing its size with that of surrounding structures such as the external auditory meatus and the zygomatic process of the temporal bone. Mastoid processes vary considerably in their proportions. Most important to consider in scoring this trait is the volume of the mastoid process, not its length. Minimal expression (score = "1") is a very small mastoid process that projects only a small distance below the inferior margins of the external auditory meatus and the digastric groove. Score as "5" a massive mastoid process with lengths and widths several times that of the external auditory meatus.

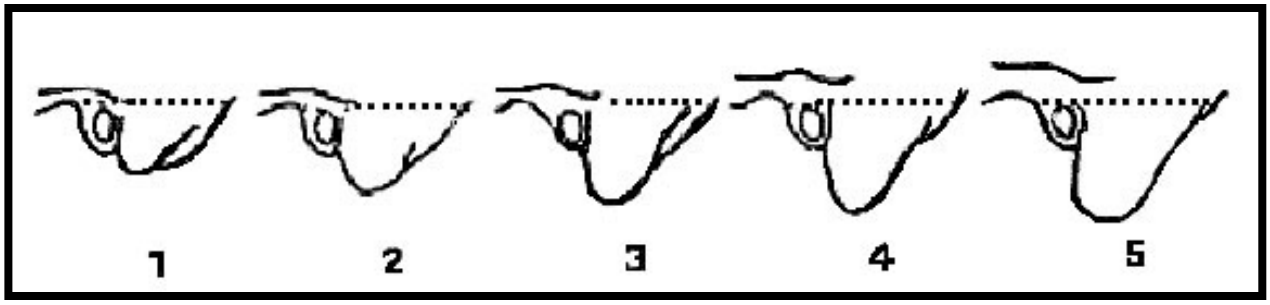

Figure 2: Standard for scoring the mastoid process. Unobservable traits receive a score of "0" (after Acsadi and Nemeskeri, 1970).

Supraorbital Margin: Begin by holding your finger against the margin of the orbit at the lateral aspect of the supraorbital foramen. Then hold the edge of the orbit between your fingers to determine its thickness. Look at each of the diagrams to determine which it matches most closely. In an example of minimal expression (score = "1"), the border should feel extremely sharp, like the edge of a slightly dulled knife. A thick, rounded margin with a curvature approximating a pencil should be scored as "5."

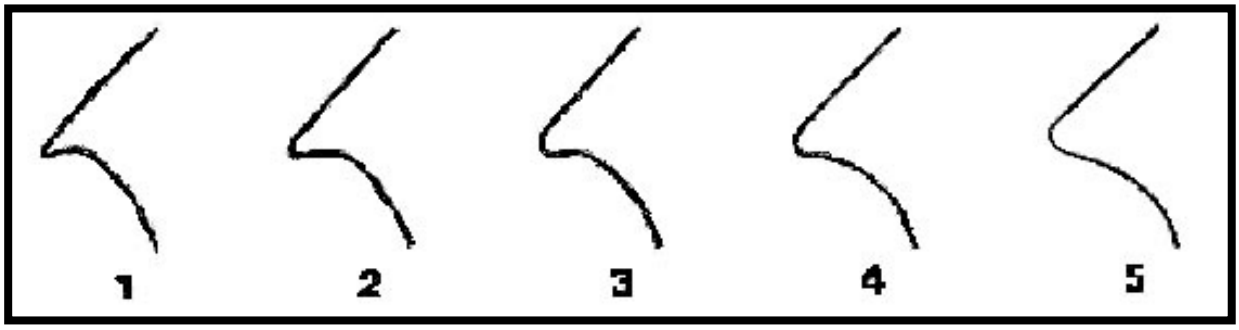

Figure 3: Standard for scoring the supraorbital margin. Unobservable traits receive a score of "0" (after Acsadi and Nemeskeri, 1970).

Prominence of Glabella: Viewing the cranium from the side, compare the profile of the supranasal region with Figure 4. In a minimal prominence of glabella (score = "1"), the contour of the frontal is smooth, with little or no projection at the midline. Maximal expression involves a massive glabellar prominence, forming a rounded, loaf-shaped projection that is frequently associated with well-developed supraorbital ridges.

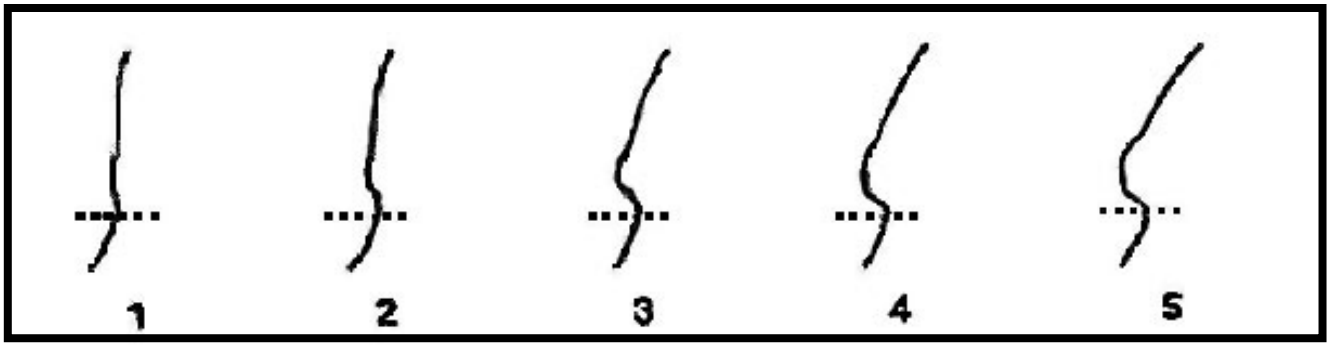

Figure 4: Standard for scoring the prominence of Glabella. Unobservable traits receive a score of "0" (after Acsadi and Nemeskeri, 1970).

Mental Eminence: Hold the mandible between the thumbs and index fingers with thumbs on either side of the mental eminence. Move the thumbs medially until they delimit the lateral borders of the mental eminence. In examples of minimal expression (score = "1"), there is little or no projection of the mental eminence above the surrounding bone. By contrast, a massive mental eminence that occupies most of the anterior portion of the mandible is scored as "5."

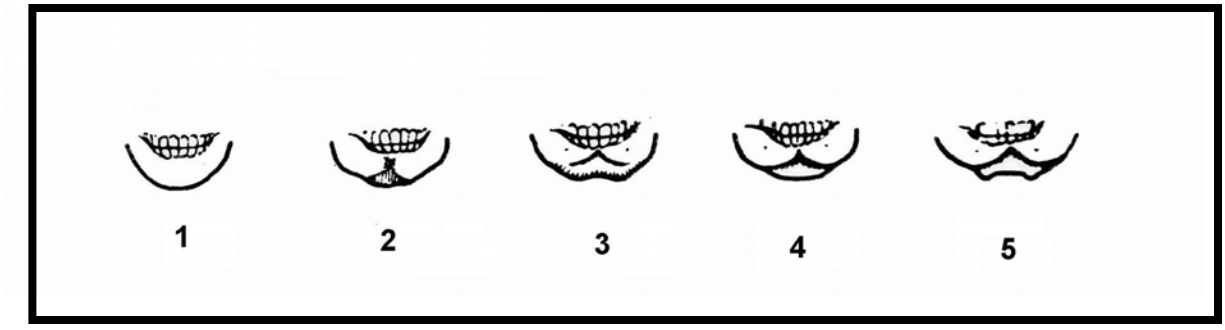

Figure 5: Standard for scoring the mental eminence. Unobservable traits receive a score of "0" (after Acsadi and Nemeskeri, 1970).

CRANIAL SUTURE CLOSURE

Cranial suture closure will be scored on the endocranial and ectocranial surfaces of three areas: the entire sagittal suture, pars lambdica and pars intermedia of the lambdoid suture, and the pars bregmatica and pars complicata of the left coronal suture (Figures 6 and 7). Use the left coronal and lambdoid sutures, but if these are unobservable, substitute the right. For complete crania, use a penlight to illuminate the endocranial surface. The scoring system is as follows:

0 Area missing, cannot be recorded
1 Open suture
2 Minimal closure
3 Significant closure
4 Complete closure

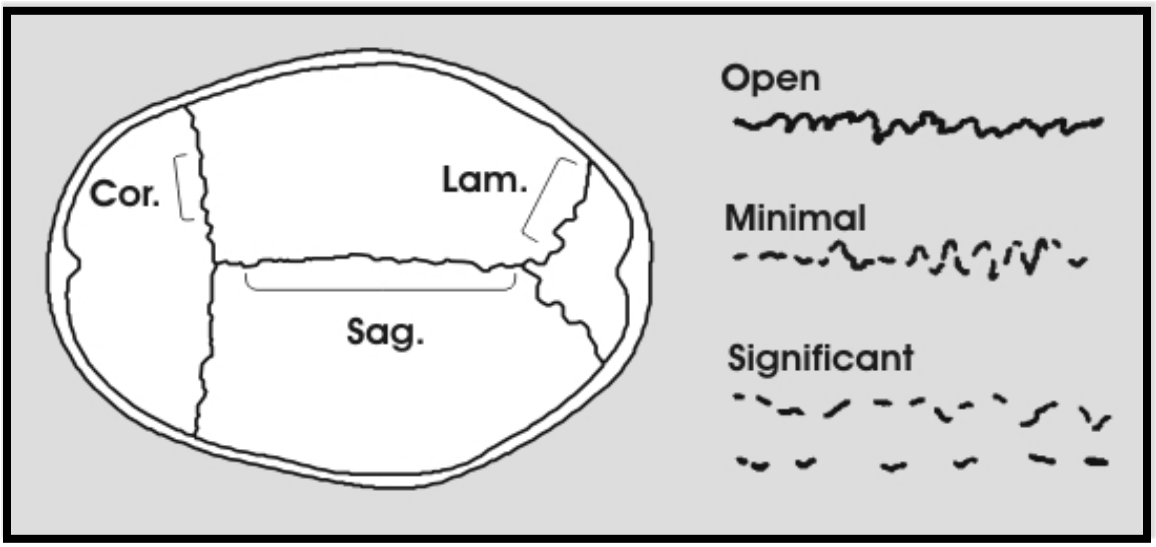

Figure 6: Left: Diagram shows the areas scored for endocranial suture closure.
Right: Stages of endocranial suture closure.

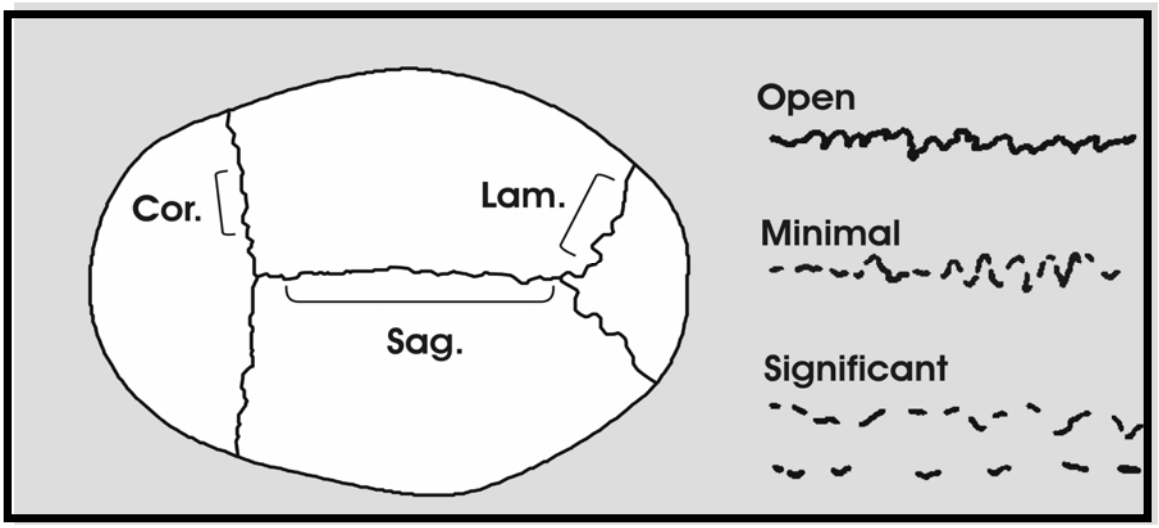

Figure 7: Left: Diagram shows the areas scored for ectocranial suture closure.
Right: Stages of ectocranial suture closure.

V. CRANIAL PATHOLOGY

CRANIAL POROSITIES: CRIBRA ORBITALIA

Cribra orbitalia is a form of slight pitting or severe porosity of the roof areas of the eye orbits (Figure 8). Researchers have linked these changes with a variety of conditions, frequently anemia (acquired and genetic), but also infections and vitamin deficiencies (e.g., scurvy, rickets; cf. Schultz, 2001; Ortner, *et al.* 1999, 2001). Without using microscopic techniques of diagnosis, cribra orbitalia is probably best regarded as a stress indicator rather than a specific disease. To score the condition, the roof of at least one eye orbit must be present. The scoring system is as follows:

0 No orbits present for observation
1 Absent with at least one observable orbit
2 A cluster of mostly fine foramina covering a small area ($\leq$1 cm^2)
3 Substantial area ($>$ 1 cm^2) covered by small and/or larger foramina with a tendency to cluster together.

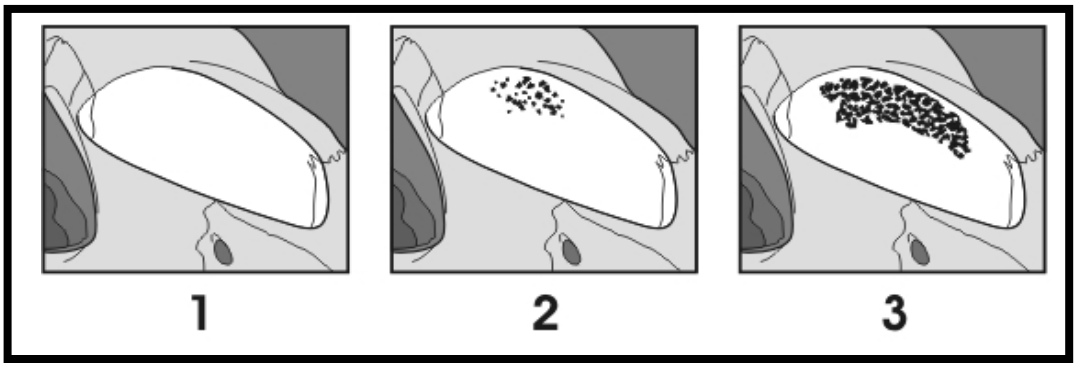

Figure 8: Standard for scoring cribra orbitalia

CRANIAL POROSITIES: POROTIC HYPEROSTOSIS

Porotic hyperostosis is a form of slight pitting or severe porosity on non-orbital, ectocranial surfaces. The porotic changes are most frequent on the squamosal portions of the occipital and the parietal bosses, and less commonly on the frontal, temporal, sphenoid, and maxilla. Like cribra orbitalia, porotic hyperostosis has been linked with a variety of conditions, including anemia (acquired and genetic), infections, and vitamin deficiencies (e.g., scurvy, rickets; cf. Schultz, 2001). Without using microscopic techniques, porotic hyperostosis is probably best regarded as a stress indicator. Score in the same manner as cribra orbitalia, although focused on the parietal. The condition will be scored as follows (Figure 9):

0 No parietals present for observation
1 Absent with at least one observable parietal
2 Presence of slight pitting or severe parietal porosity
3 Gross parietal lesion with excessive enlargement of bone

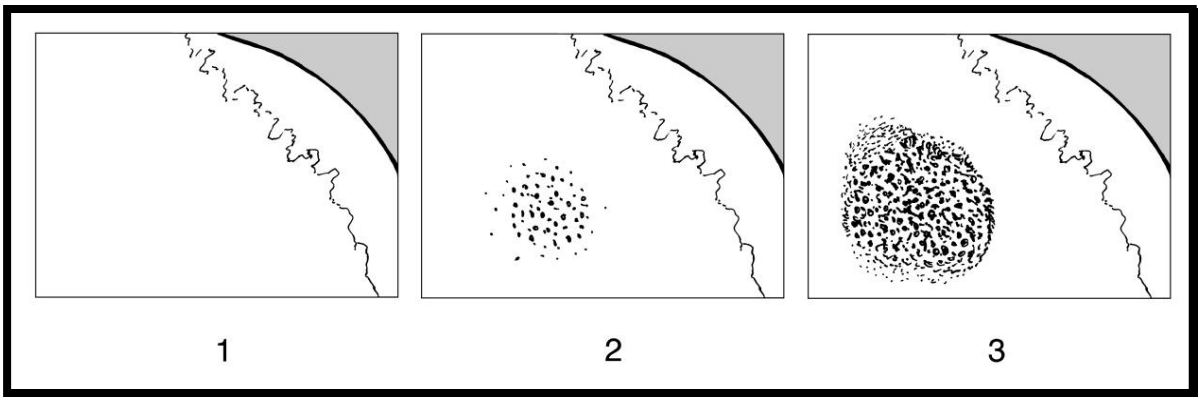

Figure 9: Standard for scoring porotic hyperostosis.

EVIDENCE OF TREPONEMATOSIS

Treponematosis refers to a group of four closely related disease syndromes: venereal syphilis, nonvenereal (endemic) syphilis or bejel, yaws, and pinta. All of the syndromes, except pinta, have skeletal involvement. The skeletal lesions are difficult to differentially diagnose, but all involve proliferative responses. For the three syndromes showing skeletal involvement, generally the areas affected are the cranial vault (especially frontal), the naso-pharyngeal area, and tibial diaphyses (lesions of the naso-pharyngeal area and tibial diaphyses are scored elsewhere).

Cranial lesions associated with treponematosis are scored as follows:

0 No bones available
1 No lesions present
2 Stellate and/or "worm-eaten" lesions on frontal or other areas of the cranial vault

DEGENERATIVE JOINT DISEASE: TEMPOROMANDIBULAR JOINT

Use the following system to record degenerative changes to the temporal mandibular joint:

0 = Joint not available for observation.
1 = Joint shows no evidence of pathological changes.
2 = Slight marginal lipping (osteophytes less than about 3mm) and slight degenerative or productive changes are present (left hand column: less than 50%, right hand column: more than 50%). No eburnation is present but the surface may include some porosity.
3 = Severe marginal lipping (osteophytes greater than about 3mm) and severe degenerative or productive changes are present. The white area in the drawing for category 3 corresponds to eburnation, which is common but not essential in this category if other degenerative aspects are severe. The surface may include substantial porosity.
4 = Complete or near complete (more than about 80%) destruction of articular surface (margin and face), including ankylosis.
5 = Joint fusion (synostosis).

NASO-PHARYNGEAL LESIONS

Resorptive bone loss in the area of the nasal aperture and nasal spine, with or without pitting of the palate, are commonly found in both treponemal disease and leprosy. Code lesions possibly indicative of these diseases as follows:

0 Nasal aperture/spine not present
1 No nasal or palatal lesions present
2 Bone loss in area of nasal aperture, nasal spine with or without pitting of the palate

VI. TEETH

ORAL HEALTH

We assess oral health through antemortem tooth loss, teeth with carious lesions, dental abscesses, and periodontitis. Dental caries is a disease process characterized by focal demineralization of dental hard 8tissues by bacterial acids produced by fermentation of dietary carbohydrates. Dental caries is multifactorial, but diet is a central factor in its cause. Typically, populations with high carbohydrate consumption express the highest prevalence of the disease. Although antemortem tooth loss frequently results from carious lesions, it may also result from periodontal disease and heavy tooth wear. Abscesses can result from progressive caries or from tooth wear rapid enough to exceed the dentin's ability to fill the pulp chamber. Abscesses can be life threatening, or at the very least diminish resistance to disease and, even more than caries, affect dietary intake. The following variables are recorded for each dentition:

1) total number of erupted tooth positions observed
2) total number of erupted permanent teeth observed
3) total number of permanent teeth with carious lesions
4) total number of teeth lost premortem
5) total number of abscesses observed

A carious lesion is "present" if a stained, irregular walled cavity is evident from visual inspection. Abscesses are recognized by a clear drainage passage in the alveolar bone leading from the tooth root(s) to the external surface of either maxilla or mandible.

Periodontitis is characterized by chronic inflammation of the gingival tissues as well as the loss of connective tissue and crestal and other supporting bone surrounding the tooth roots. This condition is largely caused by the accumulation of bacterial plaque and the response of bone and supporting connective tissue to bacterial byproducts (Loesche and Grossman, 2001). Periodontitis will be scored by documenting bone form at the buccal margin of the mandibular left second permanent molar (right side if left is missing; adapted from Ogden, 2008) using the following ordinal scale:

0 Margin not available
1 Alveolar margin meets tooth at knife-edged acute angle (no periodontitis)
2 Alveolar margin is rounded and porous, with a slightly raised rim (beginning to moderate periodontitis)
3 Alveolar margin is rounded and porous, with a trough of 2-4 mm depth between tooth and alveolus (moderate periodontitis)
4 Alveolar margin is ragged and porous, with an irregular trough or funnel of >5 mm depth between tooth and alveolus (severe periodontitis)

ENAMEL HYPOPLASIA

Enamel hypoplasia is a deficiency in enamel development caused by pathological stress associated with infectious disease, malnutrition, and other factors (Figure 10). Hypoplastic lesions form during tooth development, and provide an excellent index of levels of developmental stress. Hypoplastic lesions come in various forms ranging from small pits to prominent grooves. Data collection will be for only linear grooves clearly seen with the naked eye. A common test for presence of hypoplasias is whether the indentation can be felt with your fingernail. Do not score hypoplastic pitting as hypoplasia.

Hypoplastic lesions are most prevalent on the incisors and canines. Therefore, score only defects observed on these teeth. Note: Score as "unobservable" teeth as for which more than 50% of the crown height has been lost owing to wear, or other causes. Score the teeth on the left side of the jaw (substitute right if the left tooth is missing):

0 Tooth not present or unobservable owing to wear or other causes
1 No linear enamel hypoplasia
2 One hypoplastic line present (can be felt with your fingernail)
3 Two or more hypoplastic lines present

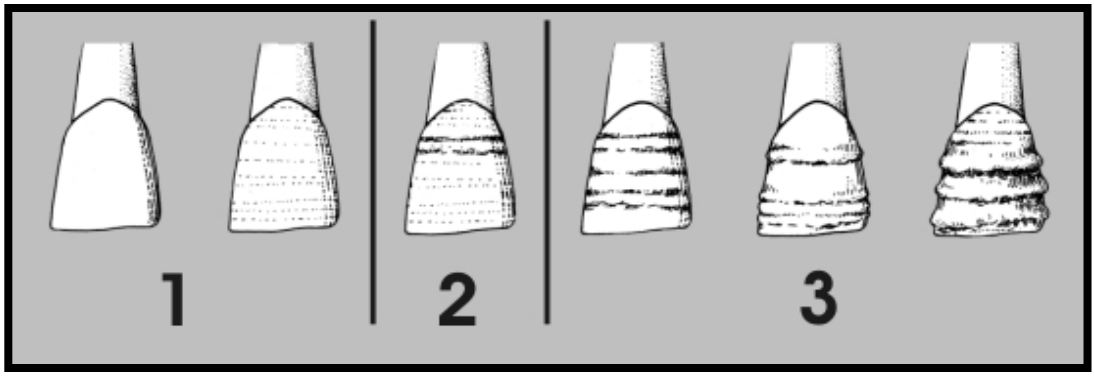

Figure 10: Dental hypoplasia standard (after Schultz, 1988).

DENTAL DEVELOPMENT

Use the following standards to designate dental development:

0 Only deciduous teeth have erupted
1 A mixed dentition is present
2 All deciduous teeth have been shed and only the permanent teeth are present, but the development is not complete
3 Dental development is complete
4 No deciduous teeth have erupted

If a dental development is incomplete, the software will ask the coder to designate the level with reference to the 21 stages illustrated in Figures 11-13. Assign the number associated with the developmental stage that it most closely approximates.

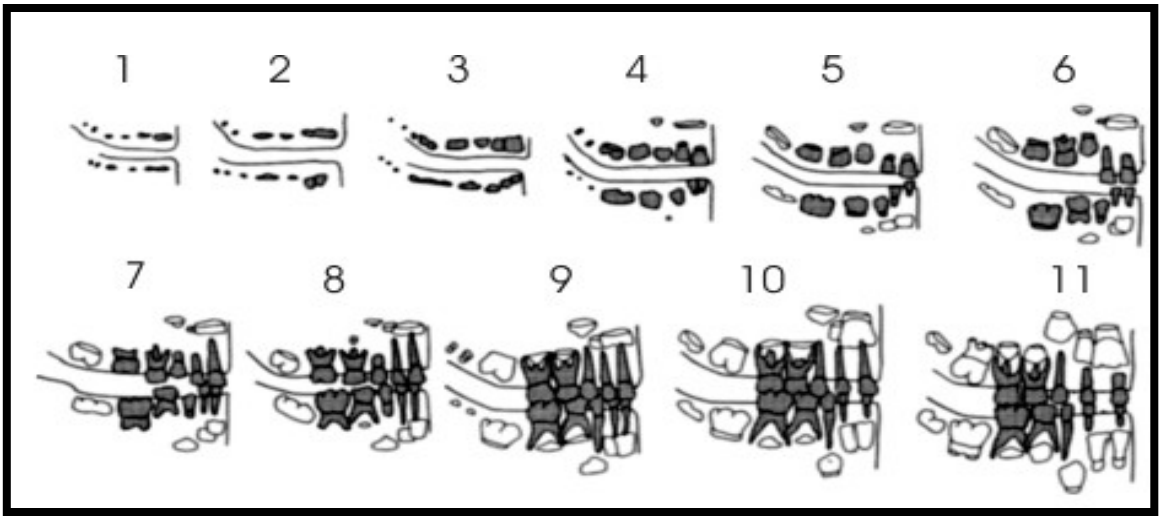

Figure 11: Sequence of formation and eruption of teeth stages 1-11 (after Ubelaker, 1989).

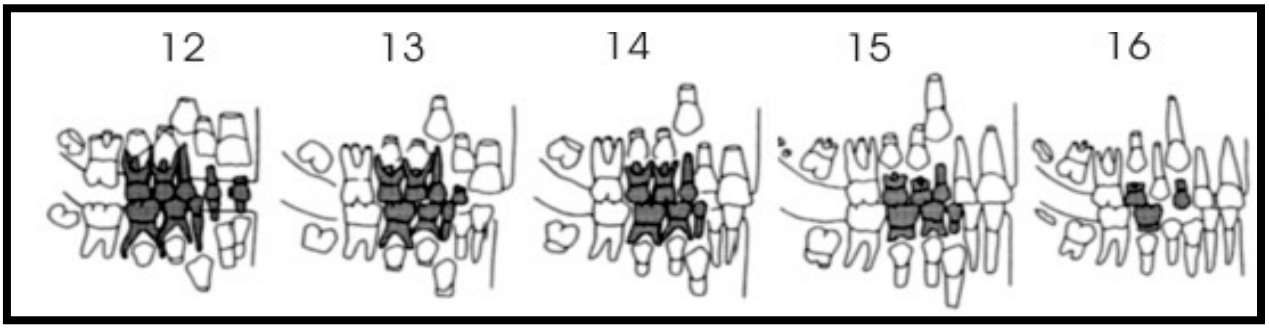

Figure 12: Sequence of formation and eruption of teeth stages 12-16 (after Ubelaker, 1989).

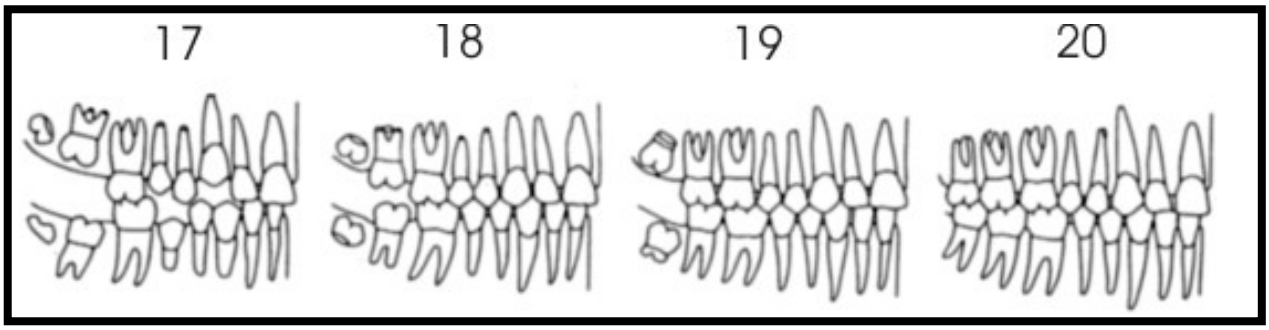

Figure 13: Sequence of formation and eruption of teeth stages 17-20 (after Ubelaker, 1989).

MOLAR INVENTORY

Specify whether erupted permanent mandibular or maxillary molars are present, and if so, which ones. Questions regarding molar wear pertain to the available teeth only.

TOOTH WEAR

Because the molars erupt on a schedule that varies little with environmental conditions, the differential wear pattern across the molars is a useful indicator of age, whereas the overall wear level reflects grit and coarseness of the diet (Walker, *et al.* 1991). Tooth wear on the occlusal surfaces of the first and second maxillary and mandibular molars is scored using a modification of the Smith (1984) method.

Codes for molar wear:

0 Tooth missing or cannot be recorded
1 Unworn to polished or small facets (no dentin exposure)
2 Blunting of cusps; may show pinpoint exposures on cusps
3 Full cusp removal with some dentin exposure
4 Several large dentin exposures but no coalescence of dentin patches
5 Two dentinal patches have coalesced
6 Three or four dentinal patches have coalesced with an island of enamel
7 Dentin exposure on entire occlusal surface, but with enamel rim retained intact or nearly so
8 Severe loss of crown height, incomplete enamel rim, crown surface shape similar to root shape

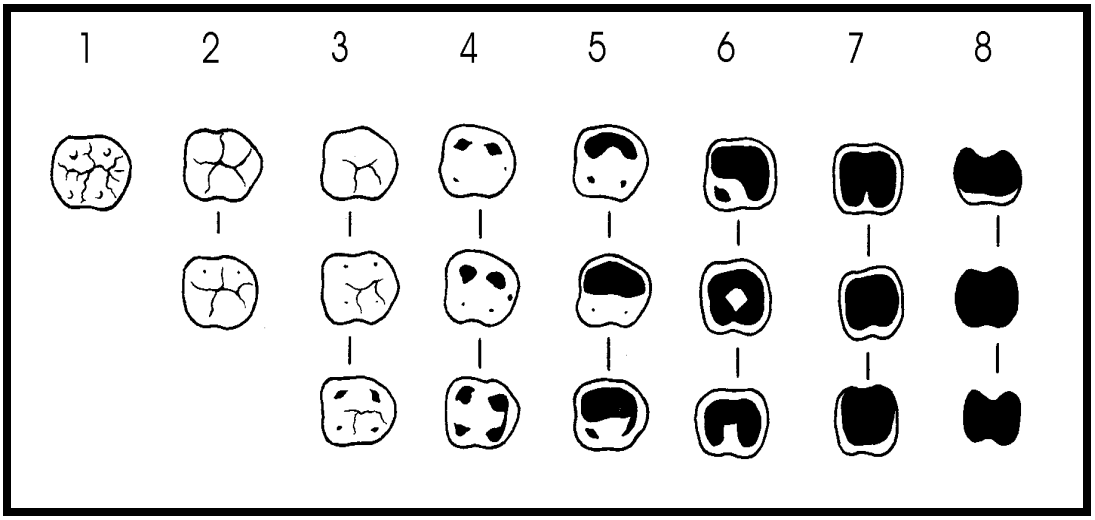

Figure 14: Diagrams of crown surface used to score stages of tooth wear. Bars between outlines connect common variants of patterns and degree of wear allowed in a stage (after Smith, 1984, Figure 7).

VII. LONG BONE INVENTORY

To allow comparison of the prevalence of pathological conditions in skeletal collections with markedly different levels of preservation, each of the major long bones (humerus, radius, ulna, femur, tibia, and fibula), as well as the clavicle from the right and left sides will be coded for the preservation of their proximal and distal articular surfaces and shafts. In this system the shaft, proximal articular surface, and the distal articular surfaces are each recorded in a separate field using the following 0-4 scale of completeness:

0 Long bone segment is missing
1 < 25% preserved
2 25- <50% preserved
3 50- 75% preserved
4 >75% preserved

The clavicle is scored using the same scale of completeness as the long bones, but it will be divided into the shaft, medial, and lateral sections.

VIII. OS COXAE MORPHOLOGY

The os coxae are scored for the following sexually dimorphic features using the systems described in Buikstra and Ubelaker (1994) and the Recommendations for Age and Sex Diagnoses of Skeletons (Workshop of European Anthropologists 1980). The subpubic concavity (Figure 16), subpubic angle (Figure 17), ischiopubic ramus ridge (Figure 18), ventral arc (Figure 19), and arc

composé (Figure 20) are scored using the same codes as the summary sex (Figure 15). The sciatic notch (Figure 21) is scored based by comparing bones with the diagrams in Acsadi and Nemeskeri (1977). All scores are for the left side, but substitute the right if the left side is not preserved. Pre-pubescent individuals should not be scored for these traits.

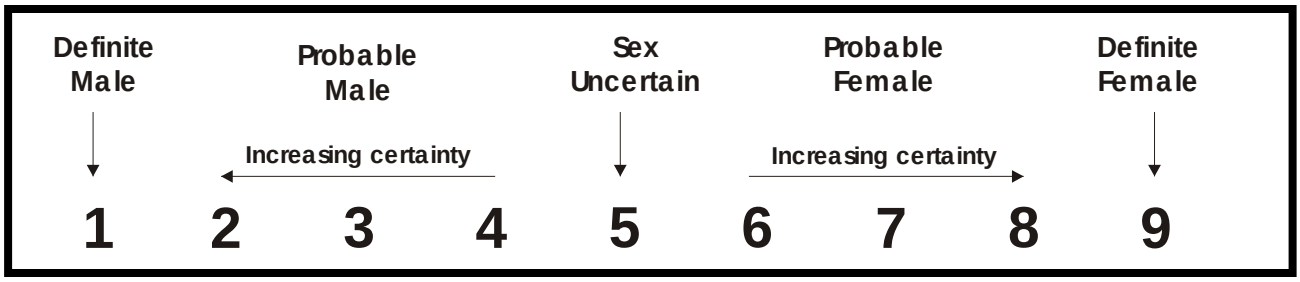

Figure 15: Scoring system for summary sex determination.

Subpubic Concavity: This feature is found on the ischiopubic ramus lateral to the symphyseal face. In females, the inferior border of the ramus is concave, in males it tends to be convex. This observation should be made while viewing the dorsal surface of the bone.

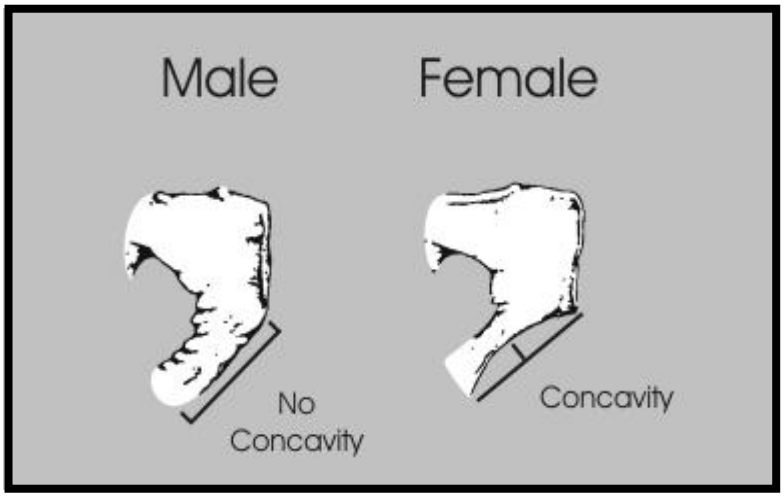

Figure 16: Sexual dimorphism of the subpubic concavity.

Subpubic Angle: The angle formed by the inferior borders of the pubic bone is wide in females and narrow in males. If only one pubic bone is preserved, extrapolate based on the morphology of the side that is preserved.

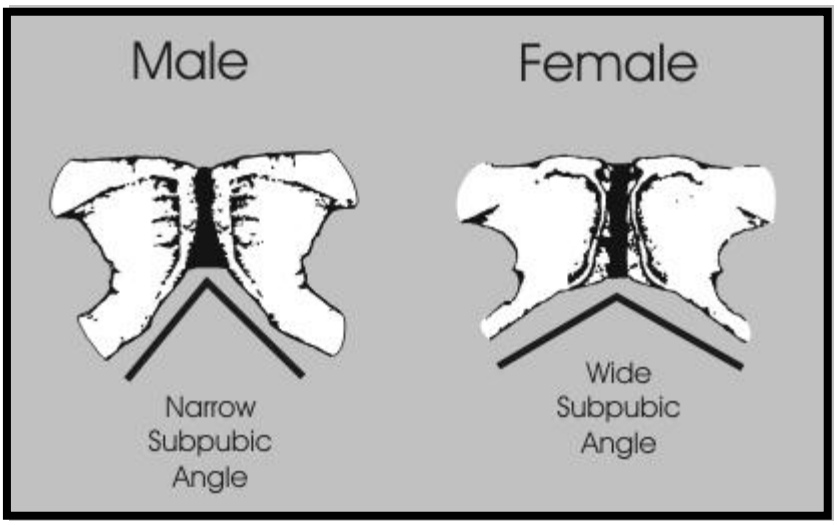

Figure 17: Sexual dimorphism of the subpubic angle.

Ischiopubic Ramus Ridge: The medial surface of the ischiopubic ramus immediately below the symphysis forms a narrow, crest-like ridge in females. This structure is broad and flat in males.

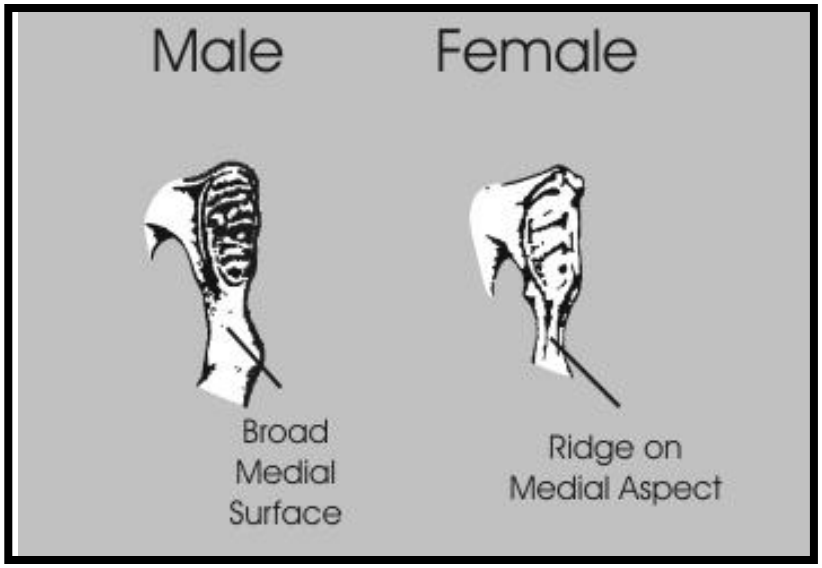

Figure 18: Sexual dimorphism of the ischiopubic ramus ridge.

Ventral Arc: The ventral arc (ventral arch ridge) is a slightly elevated ridge of bone across the ventral surface of the pubis. To facilitate scoring this feature, the pubis should be oriented with the ventral surface directly facing the observer.

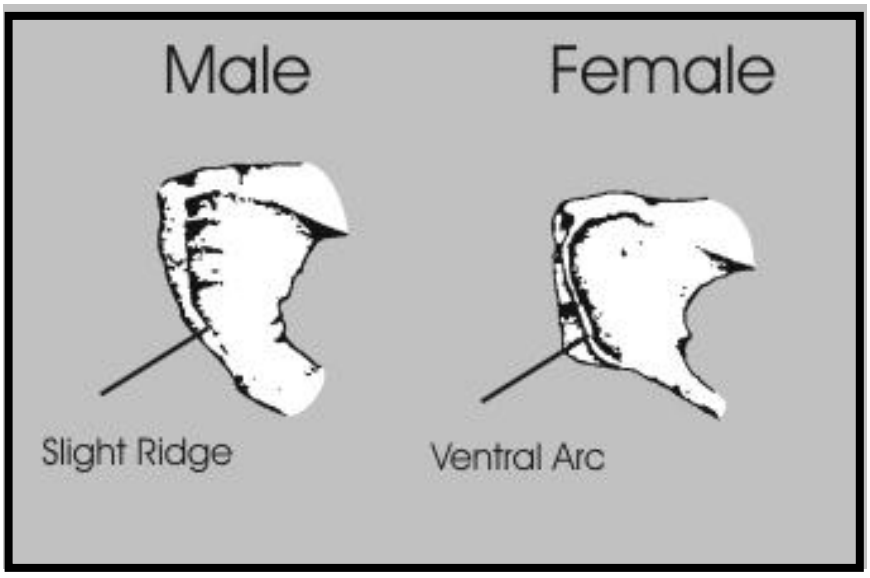

Figure 19: Sexual dimorphism of the ventral arc.

Pubic Symphysis: Score the symphyseal faces using the Suchey-Brooks system (Figure 20). For individuals whose sex is unknown, use the male or female pubic symphysis stages that the individual most closely resembles. The following are phase descriptions for the Suchey-Brooks pubic symphysis scoring system:

Phase 1: Symphyseal face has a billowing surface composed of ridges and furrows, which includes the pubic tubercle. The horizontal ridges are well marked. Ventral beveling may be commencing. Although ossific nodules may occur on the upper extremity, a key feature of this phase is the lack of delimitation for either extremity (upper or lower).

Phase 2: Symphyseal face may still show ridge development. Lower and upper extremities show early stages of delimitation, with or without ossific nodules. Ventral rampart may begin formation as extension from either or both extremities.

Phase 3: Symphyseal face shows lower extremity and ventral rampart in process of completion. Fusing ossific nodules may form upper extremity and extend along ventral border. Symphyseal face may either be smooth or retain distinct ridges. Dorsal plateau is complete. There is no lipping of symphyseal dorsal margin or bony ligamentous outgrowths.

Phase 4: Symphyseal face is generally fine-grained, although remnants of ridge and furrow system may remain. Oval outline usually complete at this stage, though a hiatus may occur in upper aspect of ventral circumference. Pubic tubercle is fully separated from the symphyseal face through definition of upper extremity. Symphyseal face may have a distinct rim. Ventrally, bony ligamentous outgrowths may occur in inferior portion of pubic bone adjacent to symphyseal face. Slight lipping may appear on dorsal border.

Phase 5: Slight depression of the face relative to a completed rim. Moderate lipping is usually found on the dorsal border with prominent ligamentous outgrowths on the ventral border. Little or no rim erosion, though breakdown possible on superior aspect of ventral border.

Phase 6: Symphyseal face shows ongoing depression as rim erodes. Ventral ligamentous attachments are marked. Pubic tubercle may appear as a separate bony knob. Face may be pitted or porous, giving an appearance of disfigurement as the ongoing process of erratic ossifications proceeds. Crenulations may occur, with the shape of the face often irregular.

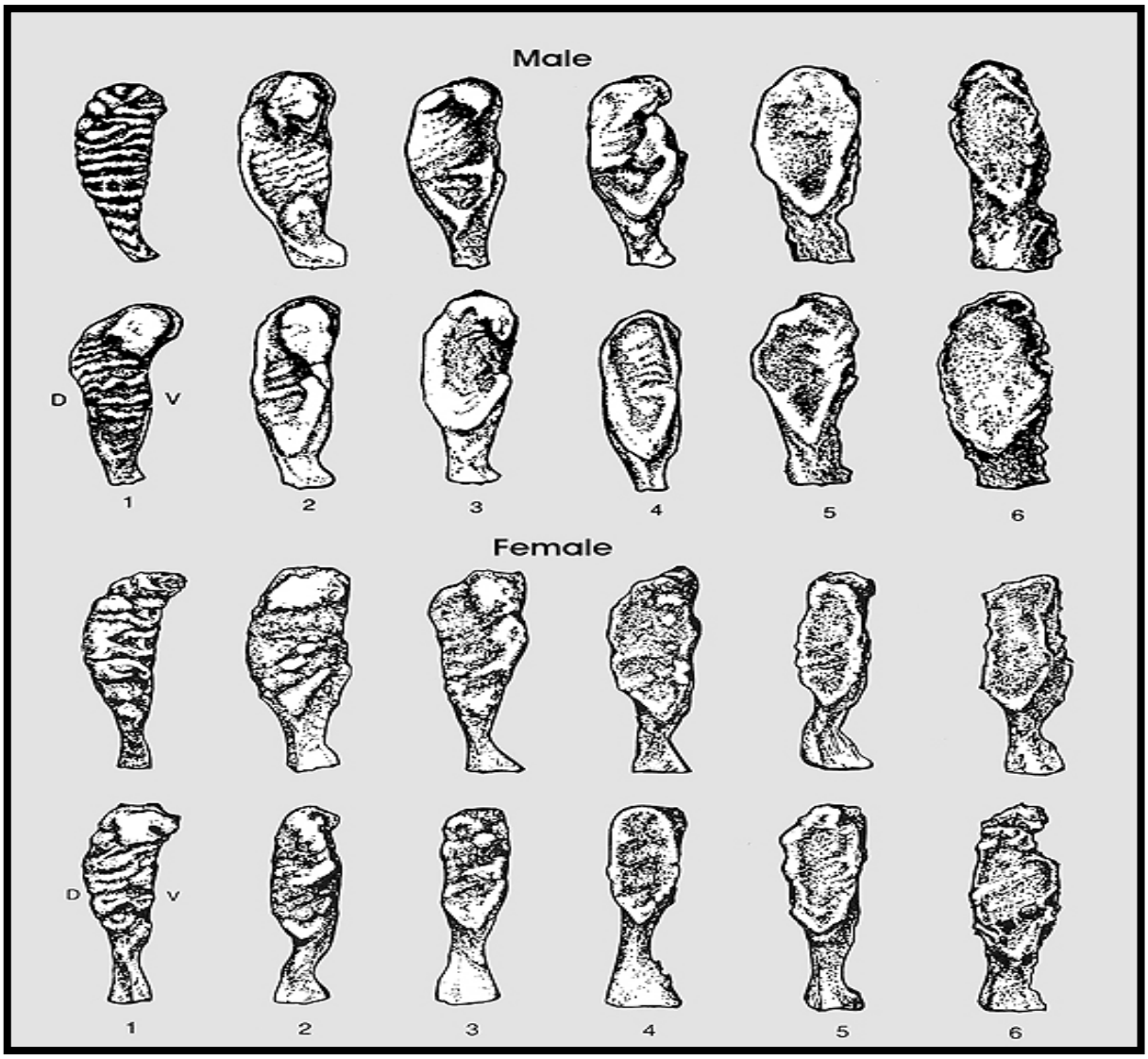

Figure 20: Suchey Brooks System for scoring phases. Top: male pubic symphysis standard; Bottom: female pubic symphysis of standard (after Buikstra and Ubelaker, 1994).

Arc Composé: Scores for the arc composé provide information on the relationship between the auricular surface and the inferior margin of the greater sciatic notch (Figure 21). Assess this feature by viewing the medial surface of the os coxae and extending an imaginary arch upward along the

inferior margin of the greater sciatic notch. If this arch coincides with an arch formed by the anterior border of the auricular surface, the individual is probably male. On the other hand, of the anterior surface of the auricular surface forms a separate arch, it is more likely that the individual is a female.

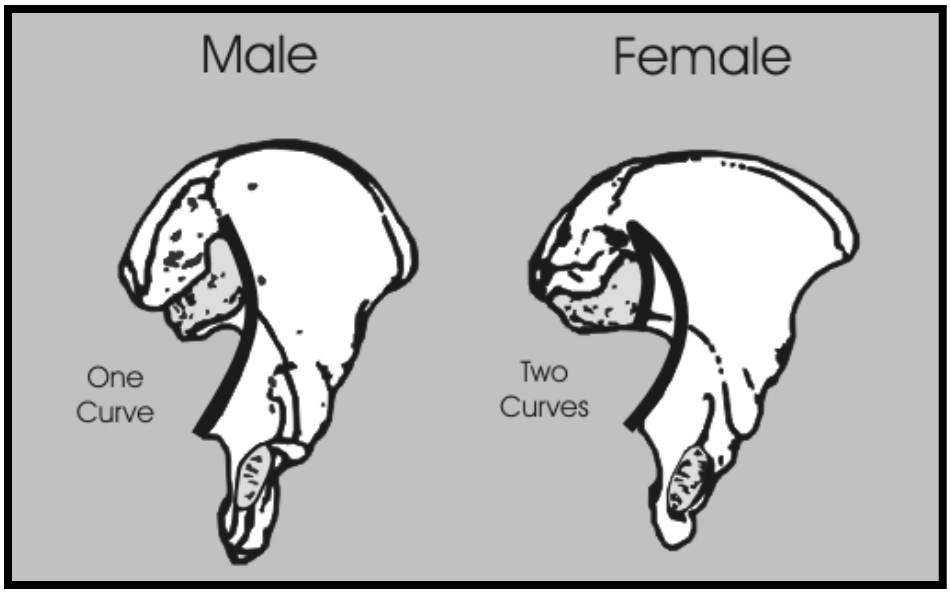

Figure 21: Sexual dimorphism of the arc composé.

Greater Sciatic Notch: The Greater Sciatic Notch tends to be wide in females and narrow in males. The shape of the greater sciatic notch is, however, not as reliable an indicator of sex as the conformation of the subpubic region due to a number of factors, including the tendency for the notch to wider in females suffering from osteomalacia. Use Figure 22 in recording greater sciatic notch form. The best results are obtained by holding the os coxae about six inches above the diagram so that the greater sciatic notch has the same orientation as the outlines, aligning the straight anterior portion of the notch that terminates at the ischial spine with the right side of the diagram. While holding the bone in this manner, move it to determine the closest match. Ignore any exostoses that may be present near the preauricular sulcus and the inferior posterior iliac spine. Configurations more extreme than "1" and "5" should be scored as "1" and "5" respectively. The illustration numbered "1" in Figure 22 presents typical female morphology, while the higher numbers show masculine conformations.

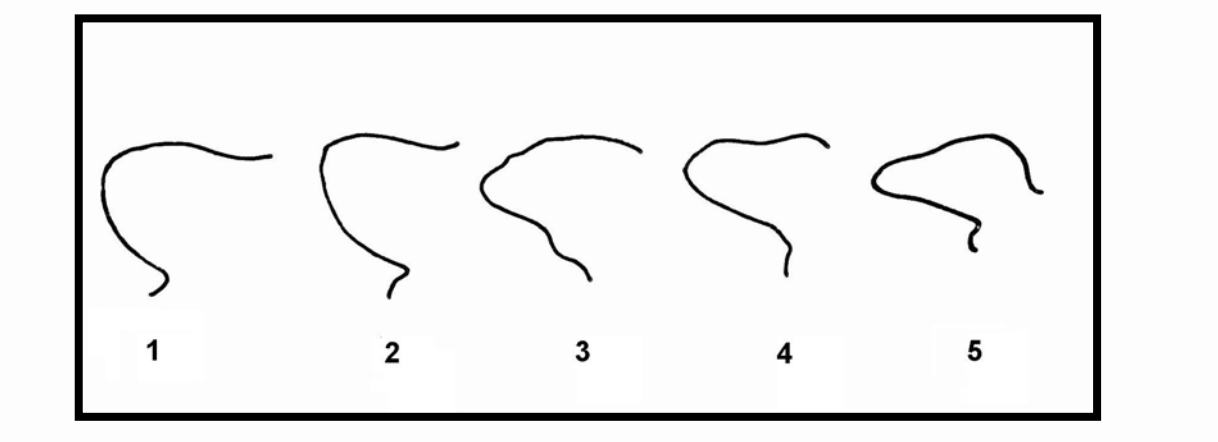

Figure 22: Standard for scoring the greater sciatic notch (after Acsadi and Nemeskeri, 1970).

Preauricular Sulcus: Score the preauricular sulcus using the system illustrated in Figure 23.

0 Trait unobservable
1 The preauricular sulcus is smooth, with no clear evidence of a sulcus is present
2 A small, weakly developed preauricular sulcus is clearly present
3 A preauricular sulcus is moderately developed
4 A large, well-defined sulcus is present

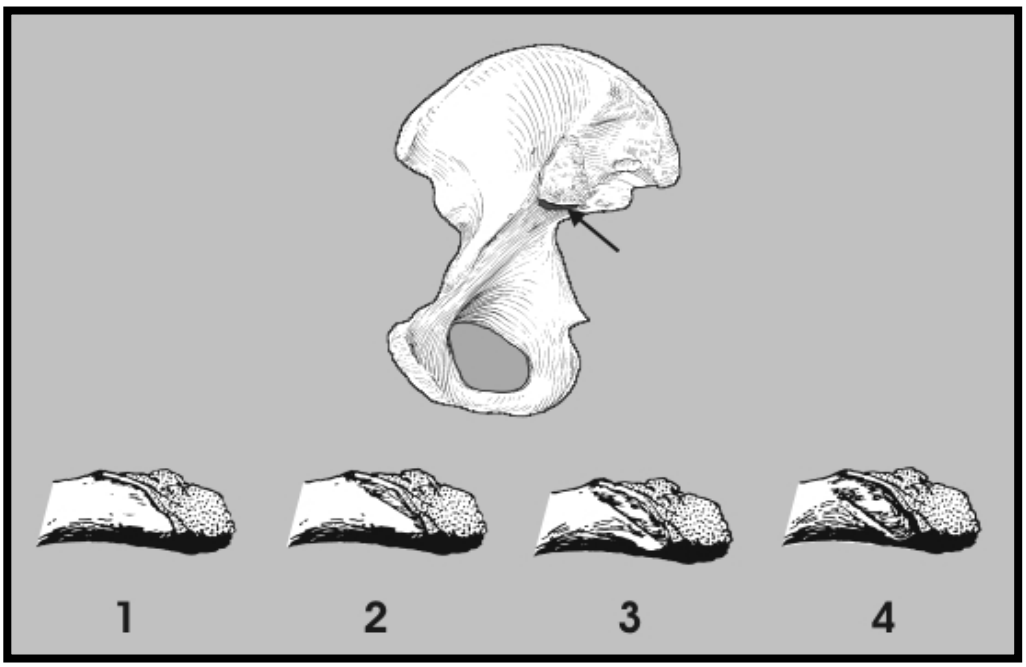

Figure 23: Standard for scoring the preauricular sulcus.

IX. LONG BONE METRICS

JUVENILE FEMUR LENGTH

The long bone lengths of children have the potential to provide information on nutritional status when compared with the stage of dental development. The investigator will provide a maximum length in millimeters to the nearest whole millimeter of a left femoral diaphysis (right if the left is not available) for individuals whose femoral epiphyses are unfused.

FEMUR SIZE AND ROBUSTICITY

Anthropological investigations show that adult femur length is highly correlated with height. The average height of a population is a good indicator of its overall health that represents the cumulative effects of diet, disease, work (or physical activity) and reproduction. Femoral robusticity is strongly influenced by sex, body weight, diet and nutrition, health status, degree of mobility, and activity patterns. Maximum length of the femur is recorded in millimeters for the left side (right when the left femur is unavailable) for fully mature elements (epiphyses fused) to the nearest whole millimeter (Figure 24). To assess femur size and robusticity, the anteroposterior (AP) and mediolateral (ML) diameters of femoral midshaft are recorded in millimeters. Since it is often preserved, and correlated with body size, the maximum head diameter for left and right femora are also recorded. All measurements are to the nearest millimeter. These dimensions are defined as follows:

Femur Maximum Head Diameter: The maximum diameter of the femoral head, wherever it occurs, recorded to the nearest whole millimeter.

Femur Maximum Length: Defined as the distance from the most superior point on the head of the femur to the most inferior point on the distal condyles to the nearest whole millimeter. Those researchers who prefer physiological femur length, should code the maximum length here but add the physiological length as a user defined variable at the end of the survey.

Femur Anteroposterior (Sagittal) Diameter at Midshaft: Use an instrument: sliding caliper to measure the distance between anterior and posterior surfaces measured proximately at the midpoint of the diaphysis, at the highest elevation of linea aspera. This is the sagittal diameter. It should be measured perpendicular to the anterior bone surface to the nearest whole millimeter.

Femur Mediolateral (Transverse) Diameter at Midshaft: Defined as the distance between the medial and lateral surfaces at midshaft, measured perpendicular to the anterior-posterior diameter. Record to the nearest whole millimeter.

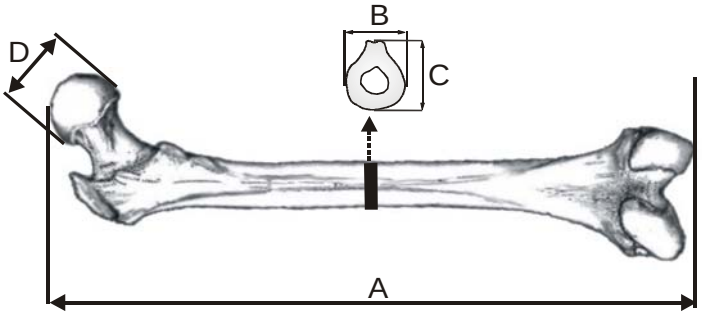

Figure 24: Femoral measurements: A= maximum length, B= mediolateral midshaft diameter, C=anteroposterior midshaft diameter, D= maximum head diameter.

HUMERUS SIZE AND ROBUSTICITY

Whereas femoral robusticity reflects the influence of mechanical demands due to body weight (during locomotion) and other activities, robusticity of the humerus reflects arm use and non-ambulatory functions. Robusticity for the humerus is determined by the maximum length (measured from the medial margin of the trochlea at the distal end to the proximal surface of the head) and anteroposterior (AP) and mediolateral (ML) diameters at the midshaft. These measurements are recorded to the nearest whole millimeter and are defined as follows:

*Humerus Maximum Length***:** Direct distance from the most superior point on the head of the humerus to the most inferior point on the trochlea measured to the nearest whole millimeter. Humerus shaft should be positioned parallel to the long axis of the osteometric board.

Humerus Anteroposterior Diameter at Midshaft: Distance between anterior and posterior surfaces measured at the midpoint of the diaphysis, measured to the nearest whole millimeter. This is the sagittal diameter and should be measured perpendicular to the anterior surface of the elbow.

Humerus Mediolateral Diameter at Midshaft: Minimum diameter of midshaft distance between the medial and lateral surfaces at midshaft, measured perpendicular to the anterior-posterior diameter to the nearest whole millimeter (Figure 24).

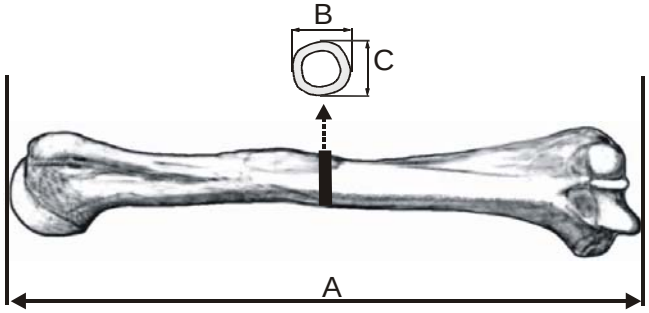

Figure 25: Humeral measurements: A= maximum length, B= mediolateral midshaft diameter, C=anteroposterior midshaft diameter

X. TRAUMA

Trauma provides important evidence of accidents, violence, and medical treatment, although the latter is probably quite rare in most of our samples (hospital populations are an exception). Different lifeways provide the context for different types of injuries. For example, populations living in mountainous terrain typically had more fractures resulting from falls than populations living on flat terrain, whereas injuries deriving from violence often varied across social landscapes. Under periods of stress, for example, some populations have shown more injuries associated from violent encounters, both at the individual level and at levels of warfare involving many persons.

The user is asked whether there is evidence of trauma present for the individual being scored. If there is evidence of trauma, the following options appear:

1 Cranial Vault
2 Nasal Bones
3 Non-Nasal Facial Bones
4 Long Bones
5 Other Post-Cranial Skeletal Elements
6 Weapon Wounds

Once a skeletal region is selected as exhibiting evidence of trauma, a series of questions will follow so that a more detailed description of the injury can be obtained. The questions will be region specific, and coders will be able to choose the appropriate response from a list of choices. A free-form text box will also be included so that coders can provide more specific details about the injury that may not have been covered by the list of questions regarding skeletal trauma. Once all of the information for an injury has been entered, the coder will be asked if there are more traumatic injuries observed. If the answer is "yes," the six regional options listed above will reappear, and the questions will be repeated. This will continue until the coder indicates that all traumatic injuries have been described.

As part of the procedure, coders will be asked to describe whether the lesion is well-healed, partially healed or possible perimortem. Regarding the last, report as perimortem only if there is **CLEAR** and **CONVINCING** evidence of a perimortem injury. We realize this can be difficult to determine, especially under conditions of poor preservation. Antemortem trauma features bone remodeling in the area of the injury and well-defined callous formation in the later stages of healing. Perimortem skeletal injuries that occurred around the time of death are much more difficult to diagnose, but these fractures lack evidence of healing, typically propagate at an oblique angle to the surface of the bone, and have a color similar to the undamaged bone surface. Postmortem fractures, occurring after a bone has lost much of its collagen, tend to propagate at right angles to the bone surface and often show a color difference from the undamaged bone surface (Walker, 2001).

The region specific questions regarding traumatic injuries are listed below:

Cranial Vault:

- Select the bone(s) (frontal, parietal, temporal, occipital) affected by the fracture or wound
- Side (right, left, midline) of the fracture or wound
- Type of injury (depressed or linear) of the fracture or wound
- Whether healed (well-healed, partially healed, possible perimortem)
- Approximate size of the affected area (maximum diameter in millimeters)

Nasal Trauma:

- Select the bone(s) (nasal bone, frontal process of the maxilla) affected
- Side (right, left, midline) of the fracture or wound
- Whether healed (well-healed, partially healed, possible perimortem)

Non-Nasal Trauma:

- Select the bone(s) (maxilla, zygomatic, mandible) affected
- Side (right, left, midline) of the fracture or wound
- Whether healed (well-healed, partially healed, possible perimortem)

Long Bone and other Post-Cranial Trauma:

- Select the bone(s) (femur, humerus, radius, ulna, tibia, fibula, clavicle, ribs, etc.) affected
- For each injury list the portion of the long bone that is affected by the fracture or wound (proximal, distal, midshaft, metaphysis, etc.)
- Side (right or left) of the fracture or wound
- The type of fracture or wound: simple *(fracture resulted in 2 separate fragments)*, comminuted *(fracture resulted in 3 or more pieces),* incomplete *(fracture resulted in separation of ends, e.g. fissure or puncture fracture)*, greenstick fracture *(bending caused breakage on convex surface, but not concave*

side), severed.

- Complications, if any arising from the fracture or wound: well-aligned (no complications apparent), partially aligned, significant deformity, pseudarthrosis, joint fusion, evidence of associated infection, etc.

- Whether well-healed, partially healed, or possible perimortem

Weapon Wounds:

- Select the bone(s) affected by the weapon wound

- Side (right, left, midline) of the weapon wound

- The type of weapon wound (embedded projectile, bullet wound, cut mark from bladed weapon, etc.)

- Whether well-healed, partially healed, or possible perimortem

XI. MISCELLANEOUS PATHOLOGY

OSTEOPERIOSTITIS

Osteoperiostitis is the osseous manifestation of periosteal inflammatory responses resulting from bacterial infection or traumatic injury and other pathological processes. Osteoperiostitis can be divided into two different groups: periostitis (infectious: e.g., inflammatory process such as osteomyelitis) and periostosis (non-infectious: e.g., hemorrhagic such as in scurvy or neoplastic diseases). The reactive area of bone elicits bone production by stimulating osteoblasts lining the periosteal and endosteal membrane. The resulting lesions often feature irregular elevations of the bone surface with or without cortical thickening. Although the lesions are often minor, they can also be quite extensive, involving expansion of the cortical bone and major change from the normal.

Score the long bones for osteoperiostitis using the following system (Figure 26):

1 No osteoperiostitis present
2 Markedly accentuated longitudinal striations
3 Slight, discrete patch(es) of reactive bone involving less than one quarter of the long bone surface
4 Moderate involvement of the periosteum, but less than one-half of the long bone surface
5 Extensive periosteal reaction involving over half of the diaphysis, with cortical expansion, pronounced deformation
6 Osteomyelitis (infection involving most of the diaphysis with cloacae
7 Osteoperiostitis associated with a fracture

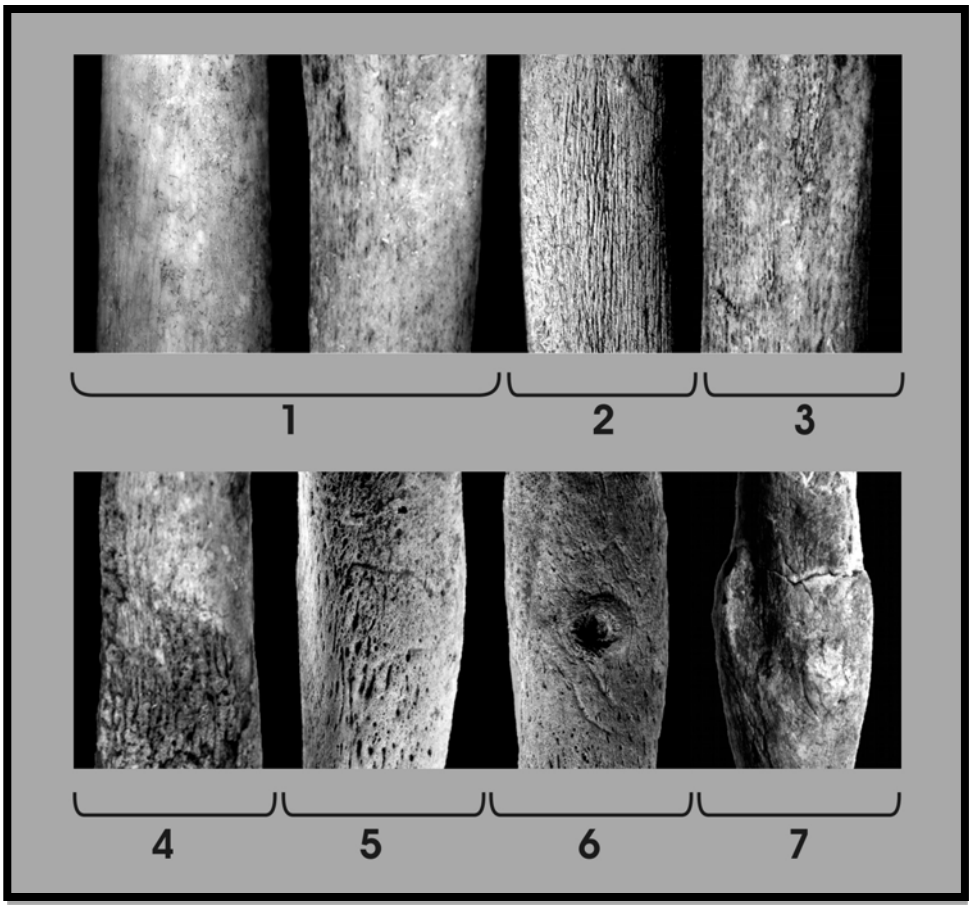

Figure 26: Standard for scoring osteoperiostitis.

DEGENERATIVE JOINT DISEASE: LIMB JOINTS

Workload and activity have important implications for quality of life and health in the past. In addition to the measurement of long bone diaphyseal cross sections, pathological indicators provide important perspective on activity and behavior. Most commonly, these pathological indicators are a result of degenerative conditions (osteoarthrosis) frequently combined with secondary aseptic inflammation involving the synarthrotic joints such as vertebral bodies and diarthrodial joints such as limb joints. Lesions may also result from primary inflammatory processes such as those seen in septic or rheumatoid joint diseases (osteoarthritis). The physical manifestation of pathology is most commonly marginal (osteophytic) lipping. In severe form, the articular surface can be pitted and/or polished (eburnation), and ultimately destruction of the joint surface. DJD is created a number of factors but mechanical stress associated with physical activity, in combination with a genetic predisposition, is often involved. In addition to differences by joint, variation in age is highly informative about the behavioral and life experiences of a population at it relates to workload and activity. Score six limb joints or joint groups: shoulder, elbow, hip, knee, wrist/hand, and ankle/foot. The scoring will be done for 12 fields (left and right for each joint type). Include all available elements, but only one element has to show degenerative modifications in order to report DJD. If both articular surfaces are present, score according to the most severe expression.

Observations for non-vertebral joints are as follows:

0 = Joint not available for observation.
1 = Joint shows no evidence of pathological changes.
2 = Slight marginal lipping (osteophytes less than about 3mm) and slight degenerative or productive changes are present (left hand column: less than 50%, right hand column: more than 50%). No eburnation is present but the surface may include some porosity.
3 = Severe marginal lipping (osteophytes greater than about 3mm) and severe degenerative or productive changes are present. The white area in the drawing for category 3 corresponds to eburnation, which is common but not essential in this category if other degenerative aspects are severe. The surface may include substantial porosity.
4 = Complete or near complete (more than about 80%) destruction of articular surface (margin and face), including ankylosis.
5 = Joint fusion (synostosis).

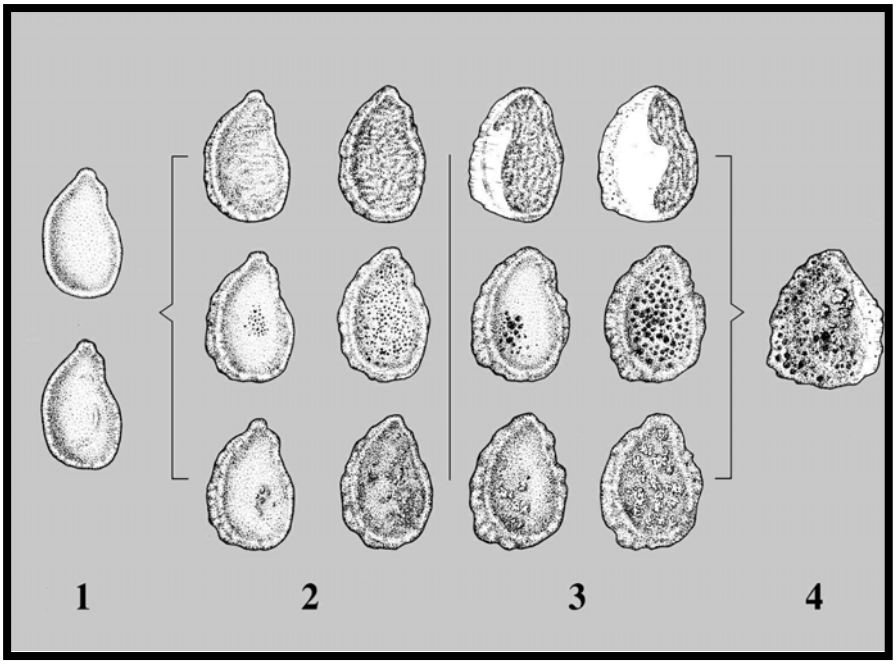

Figure 27: Standard for scoring degenerative joint disease of the glenoid cavity (after Schultz, 1988).

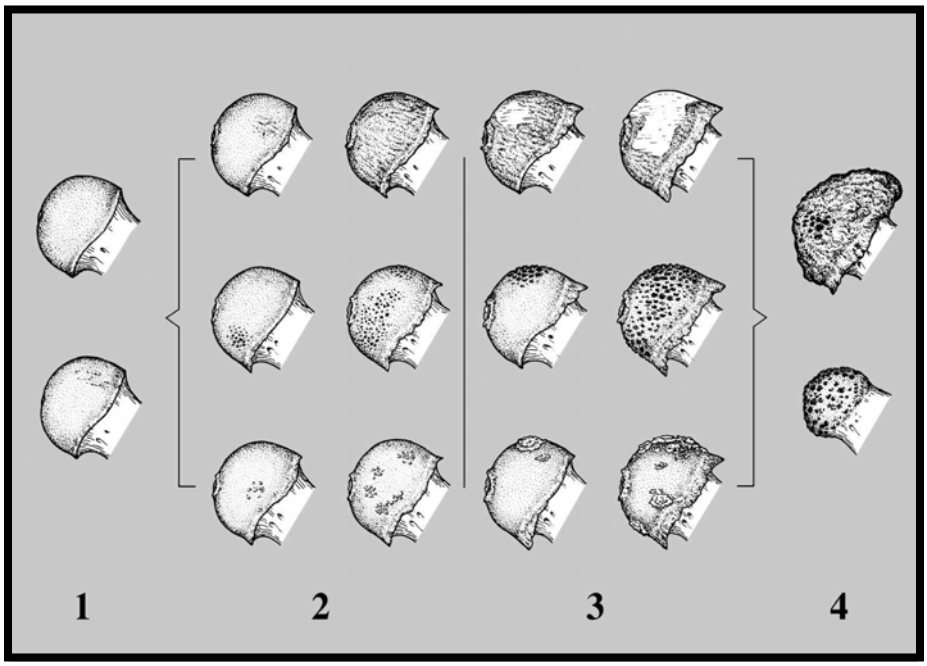

Figure 28: Standard for scoring degenerative joint disease of the femoral head (after Schultz, 1988).

DEGENERATIVE JOINT DISEASE: VERTEBRAE

The cervical, thoracic, and lumbar areas are scored separately. Observations for vertebral joints (scoring just bodies) are as follows (Figure 29):

0 Vertebral bodies not available for observation.
1 No degenerative joint disease in preserved vertebral bodies.
2 Osteophyte formation on at least one vertebral body.
3 Extensive osteophyte formation on at least one vertebral body.

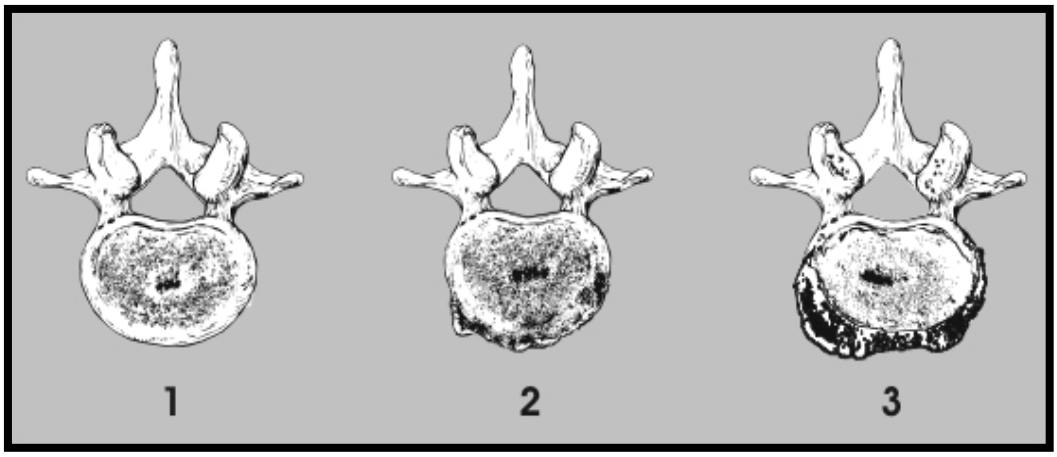

Figure 29: Standard for scoring degenerative joint disease of the vertebral column (Diagram: Walker, 2003)

DISH (DIFFUSE IDIOPATHIC SKELETAL HYPEROSTOSIS)

DISH is an enthesopathic condition of the paraspinal ligaments (most commonly the thoracic anterior longitudinal ligament of the right side). It is characterized by flowing, candle-wax-like, ossifications along the anterolateral aspect of contiguous vertebral bodies and the preservation of the intervertebral disk spaces. At least two complete bony bridges between contiguous vertebrae are needed to confirm DISH. The intervertebral disc space is spared from fusion and disc height is retained. Diagnosis of these vertebral manifestations of DISH is supported by extra-spinal ossification of entheses along the linea aspera of the femora, and at the the attachments (entheses) for Mm. quadriceps femoris (on the patellae), M. triceps brachii (olecranon process of the ulna), Tendo Achilles (tuber calcis of the calcaneus), M. biceps brachii (radial tuberosity of the radius), the hamstrings (M. semimembranosus, M. semitendinosus, and long head of M. biceps femoris)(at the ischial tuberosity) , M. obliquus externus and M. obliquus internus abdominis (on the iliac crest of the ilium).

The presence of these pathognomonic features will be noted using the following codes:

0 Vertebrae not available for observation.
1 No evidence of DISH.
2 Some or all of the pathognomonic features of DISH present.

EVIDENCE OF TUBERCULOSIS

Tuberculosis results in destruction of skeletal tissue, most commonly expressed as erosive vertebral lesions of the lower back (lower thoracic, upper lumbar). In addition, resorptive and slight proliferative changes of the pleural surfaces of ribs may be associated with the disease, but are not necessarily diagnostic of TB. Although not specific to TB, rib lesions will be recorded in this section.

Primary diagnostic criteria: destructive lesions on the lower thoracic and/or lumbar vertebral bodies, with possible collapse of the bodies.

Vertebrae:

0 No thoracic and/or lumbar vertebrae present.
1 No lytic lesions observable on vertebral bodies.
2 Lytic lesions on at least one thoracic or lumbar vertebral body(ies).

Secondary diagnostic criteria (possibly tuberculosis): a) new bone formation on the visceral surfaces of the ribs, b) unilateral destruction of hip and/or knee joint surfaces.

Ribs present:

1-24 Number of ribs heads presents (estimate if necessary).

Rib Lesions:

0 No proliferative lesions on pleural surfaces.
1-24 Number of ribs with lesions on pleural surfaces.

Hip/Knee Joints:

0 No hip/knee joint surfaces present for observation.
1 No destructive lesions present on any observable hip/knee joints.
2 Destructive lesions present on at least one hip/knee joint surface.

EVIDENCE OF SCURVY OR RICKETS

Please record evidence of scurvy *or* rickets present for the individual. If you select "no" you will not see any questions regarding these pathologies. If one *or* the other is present select "yes" and you will have the opportunity to record presence or absence for both.

SCURVY

Scurvy results from a diet deficient in vitamin C, and in children (but not in adults), many of the osseous changes seen in scurvy superficially resemble those of rickets. Purported cases in the paleopathological literature typically show scorbutic lesions (substantial bone appositions replacing subperiosteal hemorrhages) along the long bone shafts of the extremities, the costochondral joints of the ribs, and in case of children, also on the skull (greater wing of the sphenoid, as well as other areas such as the internal surface of the zygomatic, posterior surface of the maxilla, and the area of the infraorbital foramen; see Ortner *et al.* 1999, 2001). Score these indications of scurvy as follows:

0 No cranial or long bones present for observation
1 No lesions possibly indicative of scurvy
2 Presence of substantial new bone apposition on the surfaces of the long bones/ribs (e.g. humerus, radius, ulna, femur, costochondral joints) and/or pathological pitting and new-bone formation on bones of the face (e.g., maxilla, zygomatic bone) and the neurocranium (e.g., frontal and parietal eminences of the vault, squamous part of temporal bone, greater wing of sphenoid, and orbit) possibly indicative of scurvy.

RICKETS

The skeletal manifestations of rickets (childhood vitamin D deficiency) include splaying and cupping of the long bone metaphyses, bowing of lower limb bones and occasionally upper limb bones, and enlargement of the sternal ends of the ribs. There are also sometimes porotic changes and porotic bone appositions on the external (and internal) surfaces of the skull bones (cf. Schultz, 2001). Score these indications of rickets as follows:

0 No bones available for observation
1 No lesions possibly indicative of rickets
2 Indications of rickets such as bowing of leg bones, metaphyseal expansion and cupping, expansion of the sternal ends of the ribs, and porotic cranial changes

EVIDENCE OF LEPROSY

Leprosy (Hansen's disease) is an infectious disease affecting the sheaths of the peripheral nerves. The primary effect of the bacteria causing leprosy is damage to the nasal area of the skull; the secondary effect is on the sensory, motor, and autonomic nerves. Effects on the skeleton depend on whether a person has the low resistant form (lepromatous) or high resistant form (tuberculoid). Lepromatous leprosy is characterized by the presence of facial lesions and bilateral postcranial bone damage, while tuberculoid leprosy is characterized by the absence of facial lesions and unilateral postcranial bone damage. At the primary stage, there is a loss of sensation due to inadequate innervation. As a result, a minor cut or scrape does not elicit a pain response in the affected area, especially the fingers and toes and nasal/maxillary tissues. Eventually, there is disfiguration of the fingers, toes, and nasal/maxillary tissues. In advanced cases, there is distinct rounding or atrophy of the inferior nasal aperture, reduction of nasal spine (sometimes missing altogether), atrophy/destruction of anterior maxillary alveolus, loss of anterior teeth, and atrophy and disfiguration of fingers and toes. Observations will be made of the hands and feet to record lesions possibly indicating the presence of leprosy (naso-pharyngeal lesions, which can be confused with treponematosis, are scored elsewhere).

Hands:

0 No phalanges and/or metacarpals present
1 Phalanges and/or metacarpals present, no evidence of resorptive changes
2 Distinctive resorptive modifications, such as concentric remodeling of metacarpals and phalanges, absorption and osteomyelitis of hand bones, and/or palmar grooves of the proximal hand phalanges (flexion deformity)

Feet:

0 No phalanges, metatarsals, and/or tarsals present
1 Phalanges, metatarsals, and/or tarsals present, no evidence of resorptive changes
2 Distinctive resorptive modifications, such as concentric remodeling of metatarsals and phalanges, knife-edge remodeling of metatarsals, absorption and osteomyelitis of foot bones, and/or dorsal exostoses of the tarsals ('drop foot')

XII. AGE AND SEX ESTIMATION

SUMMARY SEX DETERMINATION

The summary sex determination records the observer's best judgment concerning the sex of a skeleton. The purpose of this variable is to document the recorder's overall impression of the sexually dimorphic features observed in a skeleton. This assessment should be based upon data provided by observations of os coxae morphology, cranial morphology, and long bone dimensions discussed below. The observations recorded for these sexually dimorphic skeletal features will provide the basis for a sex determination that is independent of the summary sex determination. The summary sex determination should be based solely on the morphological features observed in the skeleton without reference to any ancillary archaeological information such as the presence of gender-specific archaeological associations. However, if the sex is known from archaeological or historical information, please indicate this in a comment (to open a text box, simply click on the comment icon near the top of the screen) to the summary sex question; the information will be very useful for estimating probabilistic models of sex determination. A single numeric indicator will identify the summary sex determination with "1" signifying definite male, "5" an individual whose sex is uncertain, and "9" signifying a definite female (Figure 15). Assign individuals that that you think are probably males scores of "2" - "4" with "2" indicating a greater certainty about the sex assignment than "4." Assign individuals that that you think are probably females scores of "6" - "8" with "8" indicating a greater certainty about the sex assignment than "6."

AGE-AT-DEATH: SUMMARY ESTIMATE

Information on age-at-death will be a key component of our demographic investigations. It will also be used in the analysis of the effects of disease, nutrition, health status, and the impacts of socioeconomic change. The human skeleton exhibits many different age-related changes (Ferembach *et al.* 1977; Workshop of European Anthropologists 1980; Buikstra and Ubelaker, 1994). Juvenile age-at-death is best estimated from dental development, especially for the first 12 years of life. Epiphyseal closure for older juveniles is also a useful indicator. Adult age-at-death is determined by a variety of methods, but pubic symphyseal development is the best for individuals between 18 and 50 years. Assessments of endocranial suture closure and tooth wear can also provide information on age at death.

The summary age is the age at death (in years) considered most likely for an individual. This is meant to be the best estimate, and often will be the midpoint of an age range estimated for that individual. The summary age will be recorded using up to four numeric fields (e.g., 0.5, 7, 35.0 or 19.99). The decimal is used (where possible) to designate tenths of years (conversion from months) for young children. The age of neonates should be coded as negative numbers (e.g. "-0.1") if preterm (numbers less than "-0.3" are so unlikely that we place these numbers out of range), with the number to the right of the decimal point representing the number of months before birth. For example, a fetus in the 7th month of gestation (2 months before birth) would receive an age of "–0.2." Because morphological differences may be slight between preterm and early post-term infants, ages up to 0.3 are acceptable for neonates. If appearance indicates a term or early post-term birth,

score as a subadult with age 0.00. Individuals believed to be adults, but lacking sufficient information for a more refined assessment will be coded "99.9" followed by a comment. Likewise, code individuals believed to be subadults, but lacking sufficient information for a more refined assessment, as "19.9" followed by a comment. Score subadults strongly thought to be aged 20+as 19.99 (the upper limit for the category) followed by a comment (similarly for adults under age 16).

AGE RANGE

The age range is the minimum and maximum ages within which the observer is confident that the individual's true age lies. Record the minimum and maximum using up to four numeric fields, in the same way as the summary age.

XIII. OTHER CONDITIONS AND CONTEXTUAL INFORMATION

ADDITIONAL AGING CRITERIA

In addition to the age-related variables coded in previous sections, there are a number of other aging criteria, such as epiphyseal fusion and tooth cementum annulations, which provide highly reliable information on age at death. These data are integrated into our database by selecting this option at the end of the data collection process. After making the selection, the user will encounter a screen, which asks the following questions:

1. Please record the summary age based on the additional aging criteria.
2. Please record the minimum age based on the additional aging criteria.
3. Please record the maximum age based on the additional aging criteria.
4. Please record the technique used to obtain these additional aging criteria.
5. Please record any additional comments on this procedure.

The first four questions are required and the fifth is optional. The user will then be asked if further additional aging criteria have been employed. If so, the same questions are repeated up to a total of six additional aging techniques.

SOCIOECONOMIC STATUS INFORMATION

A series of questions in this section allow the researcher to provide supplementary information on archaeological context relevant to the interpretation of a person's social status, in situations where individuals of possibly different status occupy the same site. Please record any information that may be available regarding the nature of social stratification in the society in which the skeleton was found, the number of strata within that society (where applicable), and the status of

the individual within the strata. A text entry box is also available to record any additional relevant information. Post-medieval, and especially industrial, societies may have large numbers of strata, which we ask you to approximate by no more than 5 layers or degrees such as professional; clerical; skilled; semi-skilled; and unskilled. Please note if the person was institutionalized at death (as in prison, poorhouse, leper colony, TB sanatorium, etc.). Military officers would fall into the first category but ordinary troops into semi-skilled. If the individual was a soldier, please denote such as "soldier, professional" or "soldier, semi-skilled." There may be cases, such as people who hauled army supplies, in which "soldier, unskilled" is appropriate. If no information whatsoever on military status is available, simply indicate "soldier, unknown" and assume for purposes of classification the person was semi-skilled. Classify clergy and entrepreneurs or business managers as "professional." The site report should indicate complications involved in making such designations. Distilling a complex society into only 5 layers, though approximate, provides information quite useful about status and health. If **all individuals** at a single site (i.e. same site number for all skeletons) have the exactly the same social status, please indicate this in the site report, but is not necessary to record the status for each individual.

BURIAL DATE INFORMATION

If information beyond that available for the site as a whole is available for the individual, please record the earliest and latest probable dates of burial. Make the range as narrow as plausible based on carbon dating, stratification, burial artifacts, and so forth. Dividing a collection into as little as two chronological parts (but more if possible) is quite useful for studying change over time. If the precise date of death is known (for example, from a tombstone), the maximum and minimum dates will be equal. We tacitly assume that death and burial dates were virtually equal, which might not be the case, as for example in re burials with artifacts from a later period. If you suspect a meaningful discrepancy between death and burial dates, please report the death date and explain in a comment.

There is no need to complete this section for each individual if everyone died at the same time (as in a battlefield situation or natural disaster) but make sure to explain this situation in the site report.

PATHOLOGICAL CONDITIONS

This field provides an opportunity for the user to record additional pathological conditions not scored elsewhere in the survey.

USER DEFINED VARIABLES

Users who are planning to collect data for personal projects should use this option to define their variables (using a brief but transparent abbreviation to define the variable name, to be recorded in the first column) and record their data, which may be either numeric or text, in the second column. Up to 16 variables are permitted. If 16 is insufficient, the researcher may create a database (such as a spreadsheet) for this purpose and attach it to the site database as a separate document (to upload such a document, see laptop instructions). In doing this, be sure to record the PSI or Case number for each skeleton.

COMMENTS

Use this space to enter any additional comments that are pertinent to this skeleton.

PHOTOGRAPHY

Training sessions will be held so that researchers can become familiar with the photography methods associated with the project. Coders will photograph each skeleton displayed in anatomical position along with more detailed photos of specific conditions of pathology and trauma as (1) a way to provide a more precise inventory of bones and their state of preservation; and (2) to provide detail on specific lesions or traits. To avoid confusion in assembling a pictorial record, be sure to write the PSI or Case number of the skeleton on a card or sheet of paper that is clearly visible in the background of the photo. Similarly, include a dimension scale in the background. The software instructions indicate how to upload such information, which will be retained as part of a large-scale relational database allowing for comparative assessment and opportunities for input regarding differential diagnosis among experts in the physical anthropology and biomedical research communities.

REFERENCES

Acsadi, G. and I. Nemeskeri (1970) *History of Human Life Span and Mortality*. Budapest: Akademiai Kiado.

Buikstra, J.E. and D. H. Ubelaker (editors) (1994) *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archeological Service, Research Series, No. 44.

Brothwell, D.R. (1965) *Digging up Bones: The Excavation, Treatment, and Study of Human Skeletal Remains*. London: The British Museum (Natural History).

Galera, V., Ubelaker, D.H., and L. A. Hayek (1998) Comparison of macroscopic cranial methods of age estimation applied to skeletons from the Terry Collection. *Journal of Forensic Science*. 43(5):933-939

Ferembach, D., Schwidetzky, I., and M. Stloukal (1977) Raccomandazioni per la determinazione dell'età e del sesso sullo scheletro. *Revista di Anthropologia* 60:5-51

Fresia, A., Ruff, C.B., and C.S. Larsen (1990) Temporal decline in bilateral asymmetry of the upper limb on the Georgia coast. In *The Archaeology of Santa Catalina de Guale: 2. Biocultural Interpretations of a Population in Transition*, edited by Clark Spencer Larsen, pp. 121-132. Anthropological Papers of the American Museum of Natural History No. 68.

Larsen, C.S. (1997) *Bioarchaeology: Interpreting Behavior from the Human Skeleton*. Cambridge: Cambridge University Press.

Loesche, W.J. and N.S. Grossman (2001) Periodontal disease as a specific, albeit chronic, infection: diagnosis and treatment. *Clinical Microbiology Reviews* 14:727-752.

Ogden, A. (2008) Advances in the palaeopathology of teeth and jaws. In *Advances in Human Palaeopathology*, edited by R. Pinhasi and S. Mays. Chichester, U.K.: John Wiley & Sons, Ltd., pp. 283-307.

Ortner, D.J.,. Kimmerle, E.H. and M. Diez (1999) Probable evidence of scurvy in subadults from archeological sites in Peru. *American Journal of Physical Anthropology*. 108:321-331.

Ortner, D.J.,. Butler. W., Cafarella, J., and L. Milligan (2001) Evidence of Probable Scurvy in Subadults From Archeological Sites in North America. *American Journal of Physical Anthropology*. 114:343–351.

Ruff, C. B. (2000) Biomechanical analyses of archaeological human skeletons. In *Biological Anthropology of the Human Skeleton*, edited by M.A. Katzenberg and S.R. Saunders. New York: Wiley-Liss, pp. 71-102.

Schultz, M. (1988) Paläopathologische Diagnostik. In R Knußmann (ed.): *Anthropologie Handbuch der vergleichenden Biologie des Menschen.* Stuttgart: Gustav Fischer Verlag, pp. 480-496.

Schultz, M. (2001) Paleohistopathology of bone: A new approach to the study of ancient diseases. *Yearbook of Physical Anthropology*. 44:106-147

Smith, B. Holly (1984) Patterns of molar wear in hunter-gatherers and agriculturalists. *American Journal of Physical Anthropology*. 63:39-56.

Ubelaker, D.H. (1989) *Human Skeletal Remains*. 2nd ed. Washington, D.C.: Taraxacum Press

Walker, P. (2001) A Bioarchaeological Perspective on the History of Violence. *Annual Review of Anthropology*. 30:573-596.

Walker, P., Dean, G., and P. Shapiro (1991) Estimating Age from Dental Wear in Archaeological Populations. In: *Advances in Dental Anthropology*, edited by M. Kelley and C. S. Larsen. New York: Alan R. Liss, pp. 169-178.

Workshop of European Anthropologists (1980) Recommendations for Age and Sex Diagnoses of Skeletons. *Journal of Human Evolution*. 9:517-549.