[[LMWBA Chapter 07- Instructor Pages]]**Instructor’s Manual**

Lab 7 Bioarchaeology and Forensic Anthropology

**Answers to Lab 7 Concept Review Questions**

1. **Bioarchaeology is defined as the study of people from the past through the examination of their bones. A bioarchaeologist examines skeletal remains from archaeological contexts and attempts to reconstruct life histories.**

2. **Forensic anthropology is the branch of biological anthropology that applies methods of skeletal analysis to forensic contexts.**

3. **D. Distinguish between human and animal bone** is the first step in analyzing skeletal remains in both bioarchaeological and forensic contexts (not determine MNI, sex, or postmortem interval).

4. **C. Determine the minimum number of individuals** is usually the first step after skeletal remains have been identified as human (not determine pathology, age at death, or sex).

5. Any of the following answers are acceptable for aging juvenile skeletons (requiring specific bones):

**Epiphyseal fusion—identifying extent to which epiphyses have fused to diaphysis (requires long bones)**

**Tooth eruption—identifying the extent to which teeth have grown in (requires dentition)**

**Suture closure—identifying the extent to which cranial bones have fused together (requires cranial bones)**

6. Either of the following answers are acceptable for aging adult skeletons (requiring specific bones):

**Suchey–Brooks—identifying metamorphic changes on pubic symphyseal face (requires pubic symphysis)**

**Tooth wear—identifying extent to which tooth surface has worn down (requires dentition)**

7. **Pelvis or cranium** is one bone useful for determining sex.

8. **Long bones (particularly the humerus, radius, ulna, femur, tibia, and fibula) are best for stature estimates because their length strongly correlates with overall stature.**

9. **Manner of death refers to the circumstances surrounding death that might have contributed to death. It is addressed by forensic anthropologists. Cause of death is a physiological explanation for death. It is determined by the coroner (not the forensic anthropologist).**

10. **False**; antemortem pathology is *not* pathology that occurs around the time of death and may have contributed to death. Perimortem pathology occurs around the time of death. Antemortem occus before death.

**Answers to Lab 7 Exercises**

Exercise 1: Animal or Human? (5 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the images of two femurs (A is human, B is chimpanzee) provided in the lab Appendix. (Note: The final trait may be mentioned if students have already covered Lab 14.)*

Review the skeletal material provided by your instructor (or the image in the lab Appendix) and answer the questions below.

1. Which of the skeletal elements below belongs to a human? **A**

2. Describe *one* trait that helped you make this distinction:   
**Human femur is longer than animal femur; animal femur is less slender and more robust than human femur; human femur is angled medially when viewed anteriorly**

Exercise 2: Minimum Number of Individuals (10 to 15 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the image provided.*

Refer to the skeletal material provided by your instructor (or the mystery assemblage in the lab Appendix) to answer the questions below.

1. List the bones depicted. (Be as specific as possible, including the side of the body that the bone is from, if applicable.)

**2 right femur bones, 1 right tibia, 1 right humerus, 1 mandible, 3 vertebrae**

2. What is the minimum number of individuals in this assemblage? **2**

Exercise 3: Aging (10 to 15 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the images provided.*

Review the skeletal material provided by your instructor (or the images in the text or lab Appendix) to answer the questions below.

1. Examine the X-ray of a juvenile upper and lower jaw in FIGURE 7.9 and compare it to the dental eruption age stages in FIGURE 7.10. What is the approximate age of this individual?

**Approximate age = 10 years old (+/– 30 months)**

2. Examine the skeletal material, which is from a female and shows the symphyseal face of the pubic bone (see lab Appendix). Compare this to the Suchey–Brooks age stages provided in FIGURE 7.11 of the text. What is the approximate age of this individual?

**Approximate age of about 40 years (corresponds to female stage 4 or average 38.2 years, range 26–70 years old)**

Exercise 4: Sexing (10 to 15 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the images provided of human male and female crania and pelvises.*

Review the skeletal material provided by your instructor (or the images in the lab Appendix) and answer the questions below.

1. Which cranium belongs to a female? **B**

2. Describe *two* cranial sexing traits you used to make this determination.

**Female = lesser cranial robusticity (smaller brow ridges, smaller mastoid processes, smaller canines, rounder chin)**

**Male = greater cranial robusticity (larger brow ridges, larger mastoid processes, larger canines, squarer chin)**

3. Which pelvis belongs to a female? **A**

4. Describe *two* pelvic sexing traits you used to make this determination.

**Female = more rectangular pubis; wider subpubic angle; wider and shallower sciatic notch; wider pelvic opening; more dorsally positioned coccyx**

**Male = more triangular pubis; sharper and narrower subpubic angle; narrower and deeper sciatic notch; narrower pelvic opening; more ventrally positioned coccyx**

*Note: In general, the female pelvis is more accommodating of childbirth.*

Exercise 5: Ancestry (5 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the images provided of incisors and crania of two individuals (A without and B with shovel-shaped incisors and malar tubercle).*

Refer to the skeletal material provided by your instructor (or the images in the lab Appendix) to answer the questions below.

1. Which individual has shovel-shaped incisors? **B**

2. Which individual has the malar tubercle? **B**

3. What might these two traits indicate about these individuals’ ancestry?

**The individual with both the shovel-shaped incisors and malar tubercle is more likely to be of Asian or Native American ancestry.**

4. Are these two traits alone enough to make an ancestry determination? Why or why not?

**No, a suite of traits should be used to account for individual variations and obtain the most accurate determination possible.**

Exercise 6: Stature (5 to 15 minutes)

*Your students will probably need access to a calculator to complete the math in this exercise. You may want to provide your students with the conversion information needed to convert centimeters to inches (2.54 cm = 1 in.). Students should divide their centimeter stature estimate by 2.54 to determine stature in inches.*

*As always, you could use materials from your own collection to supplement or replace the material provided. If you do so, you could ask students to take their own measurements using an osteometric board, calipers, or tape measure. If you ask students to take their own measurements, be sure to allow for the extra class time this will require.*

Review the skeletal material provided by your instructor (or the description below) and answer the questions.

1. A forensic anthropologist has determined that a female victim has a maximum femur length of 49.5 cm. The anthropologist also determined the victim is of African ancestry. Using the table of equations to estimate stature from long bones provided in the text, estimate this individual’s stature. (Be sure to give the estimation in feet and inches, using the conversion information provided in the text.)

**Estimated stature = approximately 5 ft 8 in. (68.0 in. or 173 cm, with a likely range of 66.6 in. to 69.3 in.)**

Exercise 7: Pathology (10 to 15 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the images provided.*

Review the skeletal material provided by your instructor (or the images in the lab Appendix) and answer the questions for each scenario below.

SCENARIO A

1. What bone is this? **Lumbar vertebra**

2. What pathology is indicated on this bone? **Osteoarthritis**

3. Describe *one* trait you used to make this pathology identification.

**Presence of osteophytes**

4. Is this pathology antemortem or perimortem? **Antemortem**

SCENARIO B

1. What bone is this? **Cranium (frontal bone with damage)**

2. What pathology is indicated on this bone? **Blunt force trauma**

3. Describe *one* trait you used to make this pathology identification.

**Depression in bone with radiating fractures**

4. Is this pathology antemortem or perimortem? **Perimortem**

Exercise 8: Tying It All Together (15 to 20 minutes)

*For this exercise, you could use materials from your own collection to supplement or replace the images provided.*

A collection of skeletal remains has just been unearthed at a crime scene. You have been asked to help law enforcement officials in their investigation of this skeletal material. Refer to the skeletal material provided by your instructor (or the mystery forensic assemblage in the lab Appendix) to answer the questions below.

1. Is any of this skeletal material nonhuman? If so, which bone is nonhuman? Why do you think this? **Yes, B is nonhuman (dog). It has a pronounced snout, unusual teeth (especially canines), open eye sockets, small brain.**
2. List all of the human skeletal elements, being as specific as possible. What is the minimum number of individuals (MNI) represented here?   
   **A=cranium (adult); C=cranium (juvenile); D=lumbar vertebra; E,F,G=ribs (first through third); H=scapula (left); I=humerus (left). MNI = 2 (1 adult and 1 juvenile/newborn)**
3. Does any of the skeletal material appear to be juvenile? If so, which bone(s)? Why do you think this?  
   **Yes, C is a juvenile cranium. It has open sutures, is missing teeth, and has very underdeveloped cranial/facial features.**
4. Can any of the skeletal material be used to determine the biological sex of the victim(s)? If so, which bone(s)? What is the sex you determined? What evidence supports that conclusion?   
   **Yes, the adult cranium could be used in sex determination. It is more male. It has rugged facial features and a square chin and jaw.**
5. Bone I in the assemblage has been measured with an osteometric board. It has a maximum length of 35.7 cm. You have determined the individual is of European ancestry. Based on this information and what you know about this person’s sex, what is the estimated stature of this individual? (Be sure to give the estimation in feet and inches.)   
   **Estimated stature = approximately 5 ft 11 in. (71.0 in. or 180 cm, with a likely range of 69.4 in. to 72.6 in.)**
6. Based on the materials recovered, can you make any suggestions for additional analyses you might use to further understand the circumstances surrounding the death of the victim(s)?

**As none of these bones show obvious signs of pathology or trauma, it makes it difficult to understand the circumstances surrounding death. However, closer examination would perhaps yield additional information. For example, one could examine the ribs (and other bones) under magnification for signs of cut marks or bullet grazes.**

*This question serves as a good reminder to students that forensic work is challenging, trauma is not always obvious, and closer examination is often required.*

**Answers to Lab 7 Critical Thinking Questions**

1. The minimum number of individuals (MNI) represented by the bioarchaeological assemblage is 3 individuals (2 adults—2 sacrums, cranium with extensive tooth wear, femur with fused epiphyses; 1 juvenile—mandible with partially erupted dentition, femur with unfused epiphyses).

2. Adult skeletons cannot be aged as accurately as juvenile skeletons because of the timing of human development. We have known rates of growth and development. While the juvenile skeleton is undergoing these stages, we can pinpoint age. Adults are no longer developing, so we cannot use these known stages. Instead, we are dependent on rates of wear and tear. These rates are highly variable depending on such factors as activity pattern. Therefore, adult ages are less precise because we cannot easily account for this variation in wear and tear.

3. The estimated stature of the individual from Exercise 6 based on the new right humerus data (Black female, Hum = 35.1 cm) is approximately 5 ft 8 in. (68.0 in. or 173 cm, with a likely range of 66.3 in. to 69.7 in.). This is consistent with the estimation based on the femur measurement because estimates from both bones suggest the same mean height (68.0 in.) and similar ranges.

*Note: The range based on the femur estimate (69.4 – 66.7 = 2.7 in.) is slightly narrower than range based on the humerus (3.4 in.). The equations for stature estimation suggest that leg bones give more reliable estimates than arm bones.*

4. Antemortem pathology occurs any time before death, while perimortem pathology occurs around the time of death and may have contributed to death. The forensic anthropologist must distinguish between the two because he is trying to reconstruct the circumstances surrounding death. Thus, he gives special attention to perimortem pathology.

5. Similar—Both bioarchaeology and forensic anthropology use similar methods of analysis; they follow similar protocol, and seek to understand much of the same foundational information about the skeletal remains (age, sex, etc.).

Different—Forensic anthropology is used in forensic situations, while bioarchaeology is used with archaeological contexts; forensic anthropology focuses on understanding as much as possible about the identity of the individual(s) and the circumstances of death, while bioarchaeology attempts to reconstruct both individual and group life histories.

6. Answers to the questions concerning the role forensic anthropologists in identifying victims of the September 11 World Trade Center attack will vary, depending on the materials and information used by the students. Sample responses include these: Forensic anthropologists followed the traditional protocol, including differentiating between human bones and the bones of animals from restaurants in and around the towers. Forensic anthropologists also used DNA analysis, particularly mtDNA analysis, to help identify victims. The work of forensic anthropologists helped to identify remains from just over half of the suspected victims. Since September 11, 2001, more people have become interested in careers in forensic anthropology; methods, particularly related to the recovery of remains, have been revamped; and the New York City medical examiner’s office has expanded their full-time forensic anthropology staff.

7. Answers regarding the steps taken in analyzing the remains of 200 people from a medieval Italian cemetery for gender differences in health will vary but should include these: The first analyses that should be conducted are biological sex determination and age estimation for the individuals recovered from the cemetery. Then, indicators of health should be examined, such as dental caries (relating to high-carbohydrate diet and poor dental hygiene), dental enamel hypoplasia (indicating past nutritional stress or illness), porotic hyperostosis (indicating iron deficiency), osteoarthritis (relating to degeneration, activity patterns, and age), and trauma. To see if there was a gender difference in health, one should look to see if the various health indicators are more or less prevalent in each of the biological sexes.

8. Answers to the question of whether Julia or Marco has correctly identified the pictured bones as being from a female or male individual will vary. This question is designed to help students realize that there may be uncertainty when conducting this kind of analysis and that our interpretations are the best we can do with the evidence provided. Possible responses include these: The anthropologists disagree because a person may not have every female or male trait possible. Often an individual has mixed traits based on genetics, nutrition, hormones, age, activity patterns, etc. If students think Marco is correct that the individual is male, they should highlight male pelvic traits as their evidence (narrow subpubic angle, triangular pubis). If students think Julia is correct that the individual is female, they should highlight female cranial traits as their evidence (small brow, small zygomatic arches, round chin).

9. The disagreement in ancestry determination may reflect differences in metric and nonmetric traits. There is more within-population variation in metric traits than in nonmetric traits. For example, there is variation in stature and robusticity within each ancestral group. This means that two people with the same ancestry may have very different metric measurements. Nonmetric traits, however, are less variable within a population, making them better suited as distinguishing characteristics for different ancestral groups. Also, individual variation may be a factor because morphology is affected by age, sex, individual life history, and individual experience (health or lifestyle). This could affect some traits or morphologies differently in each individual. In addition, many people are of mixed ancestral background, so they may carry and express traits for multiple ancestral populations.