Testing body mass estimation methods: the Mississippi State Asylum Cemetery

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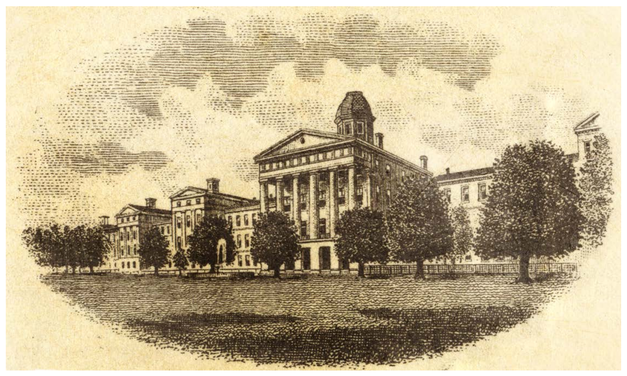
INTRODUCTION

- Body mass, the weight of a person's body, is a critical component of the biological profile.
- Current predictive models result in estimates that are associated with high error rates (Daneshvari, 2011, Lacoste Jeanson et al., 2017).
- Usefulness within forensic anthropology is questionable.
- Predictive models currently focus on:
  - Femoral head (Grine et al., 1995).
  - Bi-iliac breadth and stature (Ruff et al., 2005).
  - Subtrochanteric region of the femur (McHenry, 1988).
- Each of these methods has limitations based on the availability of particular bones.
- The multi-element model was created (Daneshvari, 2011) to minimize the drawbacks of other methods.
  - Males
    - Femur length
    - Bicondylar breadth of the femur
    - Maximum dimension of the midshaft of the tibia
  - Females
    - Femur length
    - Maximum dimension of the femoral head
    - Medio-lateral dimension of the midshaft of the femur
    - Epicondylar breadth of the humerus
- In the case of poor preservation, the multi-element method includes predictive models for 30 measurements by sex:
  - Bi-iliac breadth
  - Clavicle length
  - Femur bicondylar breadth
  - Femur head
  - Femur length
  - Femur midhsaft AP
  - Femur midshaft ML
  - Femur subtrochanteric AP
  - Femur subtrochanteric ML
  - Subtrochanteric area
  - Humerus epicondylar breadth
  - Humerus head
  - Humerus length
  - Humerus midshaft max
  - Humerus midshaft min
  - Radius length
  - Radius midshaft max
  - Radius midshaft min
  - Scapula breadth
  - Scapula height
  - Tibia length
  - Tibia length, no malleolus
  - Tibia midshaft max
  - Tibia midshaft min
  - Tibia plateau max
  - Tibia plateau min
  - Ulna length
  - Ulna length, no stylus
  - Ulna midshaft max
  - Ulna midshaft min



SAMPLE

- Excavated from the University of Mississippi Medical Center.
- Burial ground for the Mississippi State Asylum in Jackson, MS (AD 1855-1935).
- More than 10,000 burial records from the Asylum.
- Estimated that 3,000-7,000 burials remain.
- Between 1912 and 1935 most who died in the Asylum were black.
- A field school will be established on site to assist in the excavation of remains.
- There are plans to excavate, curate and allow research on the remains.
- Sixty-six unidentified burials.
- The preservation of the remains varies from well-preserved to fragmentary.
- Gives us insight into life in asylums in the 19th and early 20th centuries.

METHODS

- Attempted 30 measurements including: femoral head breadth, bi-iliac breadth and femur length, subtrochanteric dimensions of the femur, and all those used in the multi-element model.
- Determined which measurements could be ascertained
- Compared methods

RESULTS

Measurement	Number	Percent
Bi-iliac breadth	0	0
Clavicle length	0	0
Femur bicondylar breadth	0	0
Femur head	7	10.61
Femur length	0	0
Femur midhsaft AP	4	6.06
Femur midshaft ML	4	6.06
Femur subtrochanteric AP	21	31.82
Femur subtrochanteric ML	21	31.82
Subtrochanteric area	21	31.82
Humerus epicondylar breadth	7	10.61
Humerus head	2	3.03
Humerus length	2	3.03
Humerus midshaft max	6	9.09
Humerus midshaft min	6	9.09
Radius length	1	1.52
Radius midshaft max	9	13.64
Radius midshaft min	9	13.64
Scapula breadth	0	0
Scapula height	0	0
Tibia length	0	0
Tibia length, no malleolus	0	0
Tibia midshaft max	1	1.52
Tibia midshaft min	1	1.52
Tibia plateau max	0	0
Tibia plateau min	0	0
Ulna length	2	3.03
Ulna length, no stylus	2	3.03
Ulna midshaft max	11	16.67
Ulna midshaft min	11	16.67
ANY measurement possible	26	39.39

DISCUSSION AND CONCLUSION

- No measurements useful in estimating body mass could be calculated on 40 skeletons.
- Bi-iliac breadth and stature resulted in estimating body mass on zero individuals' body masses.
- Femoral head diameter resulted in estimating 10.61% of the individuals' body masses.
- Subtrochanteric dimensions resulted in estimating 31.82% of the individuals' body masses.
- Full multi-element model resulted in estimating zero individuals' body masses.
- Using ANY of the single elements resulted in 39.39% of the individuals' body masses.
- Best single measurements to use in this fragmentary collection: subtrochanteric dimensions.
- Best method to use: The single element estimates of the multi-element model.

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