Chapter 13
Assessment of Commingled Human Remains Using a GIS-Based Approach

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Introduction

The quantification of fragmentary human remains offers a challenge for physical and forensic anthropologists. Physical anthropologists frequently borrow methods and quantification techniques developed by zooarchaeologists to assess such collections. Traditionally, zooarchaeological examinations deal with highly fragmentary, commingled samples from numerous contexts. As such, the archaeofaunal literature is rich with analytical approaches to assess these complex assemblages. However, the appropriate application of zooarchaeological approaches to human bone assemblages is uncertain.

The present study examines the commingled burned human remains from the Walker-Noe site (15Gd56) in Garrard County, Kentucky. The site is a small, early Middle Woodland Adena crematory located on the southern periphery of the Bluegrass physiographic region of the state of Kentucky. Extreme fragmentation of the remains precludes the use of a simple elemental coding system to generate a skeletal inventory. This chapter details the application of a geographic information systems (GIS)-based approach developed by zooarchaeological researchers (Marean et al. 2001) to provide both a minimum number of elements (MNE) and minimum number of individuals (MNI) estimate. The methods presented in this study have applications for both bioarchaeology and forensic anthropology. The physical anthropologist needs tools to accurately quantify the number of elements and individuals recovered from a commingled context, whether prehistoric, historic, forensic, or part of a human rights investigation.

Issues of Fragmentary and Commingled Human Remains

Though several measures exist for quantifying individuals represented in an assemblage, most frequently, biological anthropologists seek to estimate the minimum number of individuals (MNI). Simply, the MNI is generated by sorting elements to side of the body and recognizing the highest value as an indicator of the number of individuals present (Grayson 1984). This generates an approximation of the minimal number of individuals represented in the assemblage but cannot be
considered as a reflection of the size of the population that produced the recovered assemblage. Estimations of the original population size are possible (see Adams and Konigsberg 2004); however, extreme bone fragmentation limits the accuracy of such approaches and renders pair-matching impossible. For most examinations of extremely fragmentary remains, the estimation of the MNI is an appropriate approach.

At the core of MNI assessments must lay an accurate determination of the minimum number of skeletal elements (MNE) present in a collection. Seemingly straightforward, the relationship between the MNE and MNI is, in practice, a complex one. The MNE is defined as a derived quantitative measure (Lyman 1994) and, as such, requires explicit definition as to its calculation. Lyman presents multiple examples of MNE definitions that would result in several different estimates. Similarly, MNI calculations based on elemental coding systems are susceptible to the same problems of over- or underestimation as the MNE. Given the basic practice of sorting and coding elements by context to side of body and recognizing the highest count as indicative of the MNI, it is apparent how such values can underrepresent or potentially inflate the MNI. Recently, Adams and Konigsberg (2004) proposed a technique for estimating the most likely number of individuals (MLNI) as a variation of the Lincoln Index (LI). However, these techniques, predominantly based upon pair-matching, are poorly suited to extremely fragmented and cremated assemblages, as noted by Adams and Konigsberg (2004). Further, in an overview of methods for interpreting cremated remains, Mayne Correia and Beattie (2002) illustrate the lack of a cohesive analytical approach to estimating the MNI from cremated remains.

Osteological data collection manuals are lacking in coding systems for highly fragmented and taphonomically modified deposits. Buikstra and Ubelaker’s (1994) osteological standards manual does provide for analysis of commingled remains, but the system is primarily useful when dealing with large fragments. Elements are to be coded according to the presence of specific percentages for the diaphysis (in thirds) and articular ends for long bones. Whole cranial elements and specific axial elements or groups of midline bones are to be recorded as such. The database recording structure presented in the standards manual (Buikstra and Ubelaker 1994) does allow for bone identification, element completeness, MNI count (based on identifiable elements), and demographic parameters. While providing a good structure for complete or near-complete skeletal recording, the methods presented in the standards manual (Buikstra and Ubelaker 1994) do not provide enough detail for highly fragmentary remains, cremations, or large commingled samples.

Church and Burgett (1996) and Burgett (1990) adapted a zooarchaeological coding system in an attempt to capture the variation in extremely fragmentary human remains. Burgett (1990) initially developed this information recording and retrieval system to document in situ commingled and fragmentary faunal remains. Church and Burgett (1996) describe the coding system as an alphanumeric identification hierarchy within which element, portion, and segment of the bone are identified. In addition to the identification hierarchy, Church and Burgett (1996) incorporate basic bone properties and taphonomic attributes. The properties fields constitute size, age,