Proposal for Long Term Study of the Human Skeletal Remains Recovered from the Santa Clara Valley Medical Center Potter’s Field

Mark C. Griffin, PhD.¹
Cynthia A. Wilczak, PhD. ¹
Eric J. Bartelink, PhD.²

¹Department of Anthropology, San Francisco State University 94132
²Department of Anthropology, California State University – Chico 95929

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Correspondence to:
Dr. Mark C. Griffin
Department of Anthropology
San Francisco State University
1600 Holloway Avenue
San Francisco, California 94132

Phone: 415-338-7519
Fax: 415-338-0550
Email: mgriffin@sfsu.edu
Background and Justification for Long Term Study

In February 2012, the remains of fifteen “uniformly-spaced coffins” were encountered during excavations for the construction of a new Services Building Replacement on the Santa Clara Valley Medical Center campus (Márquez and Rossi 2012). The coffins were deteriorated and soil had infiltrated the containers. An archive search by County staff members determined that the coffins were likely part of a cemetery that existed at the hospital from circa 1875 to 1940. The County staff concluded that the cemetery is a potter’s field, “reserved for burial of persons that were indigent, unknown, or unclaimed” (Márquez and Rossi 2012). The staff estimate that as many as 1,445 graves may be located on the campus in this area.

Indigent cemeteries contain the remains of individuals who represent the dispossessed individuals of our society. Their very presence in a “potter’s field” indicates that they were likely unknown in life and certainly unknown in death. Long-term study (curation) will allow a variety of specialists to examine the remains in detail. Studying their remains provides a way of providing these individuals voice in death that they did not have in life. Their skeletal remains provide the only objective information about their life. In the last twenty years many historical skeletal collections have been curated and documented including Lang Park (Rains and Prangnell 2002, Haslam et al. 2003), Cadia Cemetery (Lazer 2001), Freedman’s Cemetery (Peter et al. 2000), Randwick Destitute Children’s Asylum (Austral/Godden Mackay 1997), St. Brides (Milne 1997), Jewbury (Lilley et al. 1994), Spitalfields (Molleson and Cox 1993), Uxbridge Almshouse (Elia and Wesolowsky 1991), and St. Mary’s Anglican Church (Anson and Henneberg 2004). The information gained pertaining to these individual’s lives and deaths provides valuable information to the scientists conducting the research and also to the community at large. The reburial or cremation of collections such as this effectively means that they are permanently lost to science and society.

Long term study of collections such as this is the best outcome in terms of gaining the most information from the individuals recovered (Brauer 1992, Buikstra and Gordon 1981). Researchers are aware that new methods of investigation and analysis will be developed in the future and the re-study of skeletal collections with new methods may be of significant benefit to...
science and the community. With the significant outlay of time, money and resources to archaeologically excavate skeletal collections, it is in the researchers' interest to maintain access to them for extended periods of time. It is also in the interest of communities to be able to derive information from those collections on a long-term basis as new methods and approaches to skeletal analysis become available.
Outline of Proposed Research

◆ **Craniometric, osteometric, and nonmetric morphological data**
  Methodical, systematic measurement of all of the remains (all dimensions of bones and teeth) is the most time-consuming part of an analysis. There are more than three-hundred measurements that must be meticulous taken and recorded. The critical importance of these measurements is that they form the basis for all of the demographic assessments, as well as assessments of stature, weight, and many other essential analyses.

◆ **Demographic analysis**
  Assessment of sex, age-at-death, and race provides the starting point for the identification of the individual. Experience from forensic cases demonstrates that each assessment should be performed independently by at least three experts to provide the greatest accuracy.

◆ **Analysis of trauma and pathology**
  Assessment of trauma (injury) and pathology (illness) adds to the unique identification of the individual as well as provides critical information about the overall long-term health of the population (only chronic illnesses leave marks on the skeleton).

◆ **Assessment of general health indicators**
  Certain pathological conditions are of non-specific etiology and therefore provide little useful information in regard to specific diseases. They do however provide very useful indicators of general, overall health. These include dental caries (cavities), periodontal disease, dental hypoplasias (lines of growth arrest), general bone infection (periosteal reactions), and various joint diseases (osteoarthritis, spondyloarthopathies, etc.).

◆ **Assessment of occupational and activity related markers**
  Long-term activity patterns, such as manual occupations or sports activities, chronically
stress specific muscle groups, and therefore the bones to which those muscles attach. 3D scanning can help to identify those specific markers.

◆ **Stable isotope analysis**

The body incorporates chemicals from the foods that we eat into the skeleton over the course of a lifetime. Those chemicals give an unambiguous record of the quality of diet and the types of foods that we habitually eat.

◆ **DNA analysis**

DNA can be extracted from bone long after death. The bones are primarily composed of two components: calcium (inorganic component) and collagen (the organic component). As long as enough collagen remains in the bone to extract and amplify the DNA, a DNA profile can be made. Sufficient collagen can remain in skeletal tissues thousands of years after death.
Signs of Stress in a Skeleton

Hypoplasias
These lines on the teeth of postcontact Indians are the telltale signs of disease and malnutrition.

Anemia and Porotic Hyperostosis
Corn contains phytate, which inhibits the absorption of iron. As a result, many mission Indians suffered from anemia and their bones have sieve-like lesions that can be seen on the skull and in a microscopic close-up. In nonanemic individuals the dark bands would be much thicker than those shown here (right). (These lesions may also be the result of parasitic infection.)

Tooth Microwear
The teeth of mission Indians are smoother (left) than those of their ancestors (right), suggesting that the latter diet centered on soft foods, such as corn gruel, which promote the buildup of plaque and cavity-causing bacteria.

Dental Cavities
Cavities were common in Indians who ate a lot of corn—a grain that contributes to tooth decay.

Osteoarthritis: Joint Polish
Excessive wear and tear on a skeleton can be detected in several places, including the joints. Polishing of the joints indicates that cartilage was worn down and that the joint surface had deteriorated.

Retzius Lines
These growth lines can be seen in tooth enamel. In many of the mission Indians they are abnormally dark, indicating that poor diet and disease were common.

Osteoarthritis: Lipping
The vertebrae of the lower back in many mission Indians show evidence of lipping—that is, distortion from heavy lifting. The incidence of lipping and the joint polish suggest that many adult workers suffered from osteoarthritis.

Infection
The lower leg bones, or tibiae and fibulae, of many of the Indians living in the missions have visible lesions. These can be caused by bacterial infections.
Detailed Description of Analyses

Demographic Analysis

Over the past forty years there has been a continued interest in what Brothwell (1981) referred to at the “vital statistics of past populations”. The demographic profile for a site or region has the potential of revealing a number of diagnostic features for a population. Namely, sex and age ratios give vital clues in regard to population growth and decline, composition of communities, and the distribution of populations in space and time. It is expected that (1) life expectancy will vary from group to group, (2) males and females will vary in life expectancy and representation from site to site, and (3) diet, disease, culture, and environment will impact overall demographic profiles. Boddington (1987) points out that demographic reconstructions must take into account post-depositional disturbance and decay, differential burial patterns, and damage or loss due to excavation. Demographic profiles in all cemeteries will have disparate sex ratios and differential representation of age categories.

Population Affiliation Analysis

No one single trait can be used to ascertain population affinity (race). In addition, most individuals exhibit a combination of morphological traits which are found in high frequencies in different populations. Krogman and İşcan caution that "There are really no 'pure' Black skulls, or 'pure' Mediterranean skulls, and so forth. There are only skulls which, to a greater or lesser degree, present a combination of traits that suggests stock or race category" (1986:270). Therefore, when assessing racial affinity it is important to use a variety of unrelated traits and techniques in order to accurately predict race for skeletal remains. The cranium, particularly the facial skeleton, provides the most accurate estimator of race. There are techniques for certain other parts of the skeleton, but they are generally less reliable. Seventeen of the nineteen
complete numbered burials had sufficient diagnostic elements present to confidently assess population affiliation.

Population affiliation for the cranium will be ascertained using five methods: nonmetric racial traits (France and Horn 1988, Rhine 1990), discriminant function analysis of cranial morphology (Giles and Elliot 1962), computerized discriminant function analysis of cranial morphology (Jantz and Ousley 1993), analysis of midfacial indices (Gill 1984), and discriminant function analysis of the palate (Byers *et al.* 1997). Different methods do not always give congruent results, which is the reason for using multiple methods.

**Pathological Conditions**

The importance of examining the occurrence and frequency of pathological conditions in skeletal populations is that it can offer insight regarding health status and lifeways of past populations. Bearing this in mind, any paleopathological analysis should evaluate the meaning of the presence of pathological conditions in a population rather than simply cataloguing “interesting” anomalies. In the assessment of the meaning of the presence and frequency of pathological conditions there are a number of important considerations that must be kept in mind. One important consideration is that only a limited number of disease processes leave their mark on the hard tissues. As Ortner (1992:5) points out “only about 15 percent of all skeletons in a typical archaeological sample from North America will show evidence of significant disease.” Most of these cases will fall into one of three general disease categories: (1) trauma, (2) chronic bacterial infection, and (3) arthritides (degenerative joint disorders). From this observation, one might be led to the erroneous conclusion that the most important pathological conditions in prehistory fall into these three categories. The reality is that these three classifications of disease are the ones that leave their indelible mark on the hard tissues. Some of the most important diseases in human history leave no marks on the skeleton either because they are acute (i.e., they have a rapid onset and rapid resolution) or because they primarily affect the soft tissues. Most of the major epidemic diseases, which are predominantly viral rather than bacterial, fall into this category. From the foregoing, it should be gathered that most of the
pathological conditions that are recorded in skeletal populations record diseases that individuals are living with rather than dying from. Many pathological conditions then actually represent the successful response to disease rather than an indication of poor health. On the other hand, many of these conditions certainly contribute to morbidity although they may not be the proximate cause of death.
LITERATURE CITED


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