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Missing, Presumed Dead: Searching for infant mortality in excavated historic cemeteries, and finding high casualties in the archaeological record

2016

AMANDA LAUREN MURPHY

A thesis submitted to the University of Manchester for the degree of Doctor of Philosophy in the Faculty of Life Sciences
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ABSTRACT:

Archaeologically excavated historic cemeteries are a unique and largely untapped dataset for answering questions about past populations using empirical methods. One such question centers around the assumptions that infant mortality was high in societies without modern fertility control and that infant remains are more likely to be poorly preserved and recovered from archaeological contexts than adult bones. To assess this, excavated osteological populations of European descent from historic cemeteries (1600-1950 AD) were studied for their age composition as compared to historical records and Model life tables. These datasets were then considered in their taphonomic contexts to determine which factors most affect preservation and recovery. The resulting calculation of the mortality and preservation of each population were compared statistically with traditional high mortality estimates, and applied experimentally to cemetery populations with an unknown number of infants and children. Osteologically derived infant mortality was found to range most commonly from 10-35%, with a 1015% loss between burial and recovery. These figures were found to be useful in assessing early life mortality in more ancient populations. The most unexpected result was the finding that loss of data, and the resulting inability to study osteological questions with excavated historic cemeteries in general, correlated with substandard archaeological methods in some historic cemetery excavations rather than natural forces. A revival of basic, traditional archaeological methodology is necessary to maintain professional ethics; the modernization of cultural resource law in America is needed to facilitate this.
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To my grandfather, who taught me to play in the dirt. My father, who taught me how to win an argument, reminded me how much harder PhDs were “back in his day”, and provided the wine. My grandmother, who had the patience to listen to my hypotheses, and the honesty to tell me exactly what she thought of them. My mother for unconditional support, with a hefty side of corn chowder. To my brothers and sisters, who taught me how to work amidst any level of chaos. To Marco & Nic, who showed me that any really important problem can be solved with a pen and a sufficient quantity of napkins. To everyone at El Malpais & El Morro National Monuments, who lent me summer colours for the English winters. To everyone at Yosemite, who gave me another life. To Justin, who reminded me that there’s a big world out there. To John, who ran from a parrot, but walked toward a lightning storm. To Ben, who hung on past the last exit.

ABOUT THE AUTHOR:

The author received a B.A. in Archaeology cum laude from Columbia University in 2006, with an emphasis on the ancient Near East. She received her MSc. with Distinction in Human Osteology and Funerary Archaeology from the University of Sheffield in 2009. The topic of her Master’s thesis was infanticide in the ancient world and a study of infant mortality profiles from ancient Egyptian cemeteries. Over the past ten years, she has conducted professional archaeological work in five countries, including museum and lab settings, academic excavations, cultural resource management firms, and the United States National Parks Service. Her research interests include taboos, mythology, human osteology, burial rituals, demography, and taphonomy.

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CHAPTER 1: Introduction

"Archaeology is rather like a vast, fiendish jigsaw puzzle invented by the devil as an instrument of tantalizing torment, since you don’t know how many pieces are missing.” –C. Bahn, The Bluffer’s Guide to Archaeology.

AIMS & OBJECTIVES:

Archaeology is often called a soft science (McGovern, 1995). Because the practice of excavation quite literally destroys the very context which is being studied, archaeological experiments are by their nature inimitable (King, 2005). It is canon that this may be mitigated by consistently practicing sound methodology so that the conditions of excavation, if not replicable, may at least be understood as well as possible, and the data derived from them may be relied upon (Renfrew & Bahn, 2012). Unlike other sciences whose objects of study (e.g. the behaviours of disease, particles, and chemicals) are to some extent “renewable resources”, able to be experimentally created or occurring continually in the natural world, archaeological sites are finite assets, which, once destroyed, will never be created again (McGovern, 1995; King, 2005).

Archaeology is also a humanistic science. More than other sciences, it relies on imagination and intuition to develop narratives about the past (Bahn, 1984; Hodder, 1982, 2001). Perhaps because of the somewhat qualitative nature of much archaeological data, and the acceptance of storytelling as a component of the profession (Wiley & Phillips, 1958), it is sometimes possible for archaeological interpretations to become overly subjective for long periods of time without meaningful critique. This research addresses two types of current failings in archaeology of historic cemeteries: first, the repetitious use of specious “common knowledge” as a basis for drawing supposedly empirical conclusions; and second, the prioritization or exclusion of certain types of data collection based on personal preference or expediency rather than following the archaeological mandate to preserve by record. As this study will show, these tendencies to hold certain “facts” to be self-evident, and to neglect data collection which may seem onerous or uninteresting, have consistently limited archaeological interpretations and by extension, the scientific validity of much archaeological research.

RESEARCH QUESTIONS:

First, this study seeks to challenge two “common knowledge” statements about infant mortality and osteological preservation in historical archaeological populations on a large scale based: the first of these adages is that infant mortality must have typically been much higher in the past than the present (Caldwell, 1996; Caldwell and Caldwell, 2003; Chamberlain, 2006; Guy et al., 1997; Lewis and
Gowland, 2007; Sainz de la Maza Kaufman, 1997); and the second is that infant remains inherently preserve more poorly than adult remains, so their archaeological recovery rate is low compared to the number that were initially buried (Gordon & Buikstra, 1981; Guy et al., 1997). These questions are central to the archaeological study of any human population, as the health and mortality of infants and children are one of the best indicators of the overall health of the general population (Acsadi & Nemeskeri, 1970; Chamberlain, 2006); and it is not possible to postulate from skeletal data alone what early life mortality rates might be, if the preservation of the skeletal sample cannot be relied upon as a proxy (Buckberry, 2000). The ability to accurately study early life mortality has implications for the study of childcare practices, disease, urbanization, risk of early life trauma, population growth, and nutrition, among other factors.

Ostensibly, answering these two questions ought to have been a straight-forward, though time-consuming and unattempted task. It soon became apparent that many of the goals of the initial study could not be met because some field archaeologists have not collected or recorded osteological age-at-death data in useable formats: a step so elementary to the archaeological process that its continued omission in many large-scale cemetery excavations constitutes a lapse of professional ethics (Mays et al., 2012; Renfrew & Bahn, 2012). This discovery expanded the research to explore other omissions within the process of archaeological data collection in historic cemeteries. Examining quantitative differences in what constitutes an acceptable level of recordation, as well as public perception and legal requirements, this study also seeks to answer the questions, “Are archaeologists in general adhering to professional ethics and the archaeological method when it comes to historic cemetery excavation and, if not, what are some of the possible causes and solutions?” This is highly relevant to the initial research question in that researcher error, either in excavation or in identification, has always been implicated as one of the possible causes of the seemingly poor preservation of infant remains (Acsadi & Nemeskeri, 1970; Buckberry, 2000; Guy et al., 1997). Yet rates of user error in archaeological excavation and analysis have not often been studied in a quantifiable way.

Both the initial questions surrounding infant mortality and preservation, and those surrounding what constitutes an appropriate minimum level of archaeological recordation are “back to basics” questions. Yet they have the potential to unfetter research throughout the profession. For example, if user error in the study and recordation of infant remains is high, it stands to reason that it may be high in other areas as well, confounding research questions across the field. Furthermore, if assumptions regarding infant mortality and preservation have been wrong, not only is it possible to approach future research in this area more mindfully, but it may be possible to return to the study of old data with new eyes.
BIOARCHAEOLOGY: In Defence of a Bahn?

This study uses the computational bioarchaeology to create a framework for answering these larger archaeological questions. Bioarchaeology is still a relatively young and often overlooked discipline, with best practice methodologies and techniques evolving (Buikstra, 2006). Arising from a “soft science” like archaeology, the more dry and rigorous subdiscipline has often struggled to achieve or successfully promote the scientific collection of data as both a necessary step within the archaeological process, and the progenitor of engaging results. Since the transition from antiquarianism to professional archaeology, archaeological method has been standardized by archaeologists from Flinders Petrie to A. E. VanGiffen to Mortimer Wheeler (Harris, 1989; Trigger, 2007; Renfrew & Bahn, 2012; Fagan, 2014). In early years, such technique was often employed to confirm what was already “known” about the world, from what people considered to be reliable textual sources such as the Bible and Herodotus (Trigger, 2007; Fagan, 2014). Much of the work centered around accumulating beautiful trophy-like objects for private collections and supporting the view that cultures progressed through natural phases of development from the so-called primitive to the modern. Even in burials, human remains might be thrown aside, and context destroyed (Buikstra, 2006 a-e; Rakita, 2006). Ultimately, many professionals in the field became critical of such dogmatic interpretations (Trigger, 2007).

During the Culture-Historical phase of archaeology, the classification of material culture became prized as ideas of cultural evolution were cast off (Childe, 1929; Trigger, 2007; Renfrew & Bahn, 2012). This was accompanied by a sense that anthropological “meaning”, too abstruse to be comprehended from material culture alone, was often lost to history (Trigger, 2007). As with the antiquarians, elite burials were exploited for their objects and in some cases, their human remains. However, these increasingly went to massive comparative museum collections used to broadly characterize cultures (ibid.). The movement was eventually abandoned as too focused on amassing data without interpretation (Clarke, 1973, Wiley & Phillips, 1958). The overriding theme in both archaeology and the study of human osteology at the time was often driven by the desire to legitimise nationalist agendas and create cultural divisions based on race (Trigger, 2007). Selective sampling of burial elements such as skulls was used to prove these aims (Buikstra, 2006 a-e). In recent decades, archaeology has reverted to more theoretical aims focused not simply on what may be recorded and categorized, but on its meaning relative to human behaviour.

Arising in the 1950s, Processual or “New” archaeology was, to some extent, a marriage of the empiricism favoured in the Culture-Historical phase, and the romanticism of the antiquarians, who
sought to understand past lifeways as well as observe them (Wiley & Phillips, 1958). More than previous archaeologies, Processualism utilized ethnographic studies to bolster their views on environmental determinism: i.e. that cultures evolved following predictable paths driven by external stimuli (Binford, 1962, 1965, 1972; Binford & Binford, 1968; Clarke, 1973; Renfrew, 1982; Shackel & Little, 1992). In a mortuary context, this ideology focused on the spatial arrangement of cemeteries and burial as a terminus in a longer series of ritual (Buikstra, 2006). However selective sampling and racially-focused research questions continued to dominate (ibid.). As with earlier antiquarianism, which embraced historical text as truth and viewed cultures as evolving along a foreseeable track, critics of Processual archaeology quickly found fault with the rigid explanation of universal cultural trajectories and universal factors giving rise to them. Also criticized was the dogged belief that all archaeological questions could be answered if the science used was somehow rigorous enough (Kohl, 1993; Wylie, 1982)

The response to this was the development of Post-Processual archaeology in the 1970s (Hodder, 1982, 2001; Miller & Tilley, 1984; Earle & Preucel, 1987; Hodder & Hutson, 2003). Post-Processualism is unified by the view that there are many valid interpretations to past behaviours, rather than single objective truths which can be arrived at by meticulous study (ibid.). In terms of mortuary practice, this school of thought emphasized social relationships and behaviours of the mourners, rather than the deceased (Buikstra, 2006). The move from rigid, non-critical explanations of culture is desirable and commendable. However, this school has often departed from, and even mocked, the careful data retrieval or technique that developed over the previous centuries, in favour of the prioritization of so-called interesting, important, or relevant research questions (Kohl, 1993). Although constant self-evaluation is emphasized as a tenant of the school (ibid.), many such queries focus on finding the place and agency of the “individual” or “minority” in history: a goal that undeniably reflects the bias of the modern western cult of individualism (Gittings, 1984). The school’s roundest criticism has therefore been the failure of the movement to develop a unified methodology (Earle & Preucel, 1987). Hiding behind the self-professed Socratic excuse that nothing can truly be “known”, this frequently results in the use of material culture to “prove” the unsupported alongside the legitimately invisible, as well as give voice to patently antiscientific viewpoints (Kohl, 1993; Patterson, 1990).

This minimization of data is frequently justified as a sampling issue: clearly under temporal and monetary constraint, some research agendas must be ranked above others (King, 2005; Boyle, 2015; Mays et al., 2015). However, imagine a world where, if one failed to retrieve the data necessary to study multiple sclerosis during a study that was ostensibly about cancer, the data making it possible to ever
study multiple sclerosis would disappear from existence. This is the central conundrum of archaeology: until a site is excavated and studied, it is not clear what has been destroyed (McGovern, 1995; King, 2005). If the data needed to answer a future question is not recorded or sampled in the correct way, the data disappears forever. Often, especially in cases concerning human remains and objects of cultural patrimony, all that will remain of the material culture of the site after reburial or repatriation is what exists in record (Rose et al., 1996). Bioarchaeology seeks to remedy this conundrum.

Because archaeologists occupy this delicate position as they excavate a burial site, they have a duty of care unique within the sciences. No matter how carefully archaeologists consider research agendas, there will always be future methodologies which make the impossible possible. Widespread (or affordable) DNA studies, CAT and SEM scanning, mass spectrometry, palynology, parasitology, stable isotope studies, and uranium-thorium dating were pipedreams a few decades ago (McGovern, 1995; Thorne et al., 1999; King, 2005; Le Bailly et al., 2006; Larsen, 2006; Konigsburg, 2006; Brown et al., 2015). The massive quantity of osteological measurements taken by Great Depression archaeologists could not be analysed in meaningful ways simply because calculators were not yet powerful enough (Milner & Jacobi, 2006). In some cases, simple macroscopic intersite comparisons of unusual finds seemed implausible before the discovery of comparable datasets (Buikstra, 2006). Even human osteology as a practice is relatively new; accurate morphological aging and sexing techniques have completely changed the dynamics of the questions it is possible to ask within the last fifty years (Rose et al. 1996; White & Folkens, 2000; Buikstra & Beck (eds.), 2006). Rose and colleagues observed that in re-examinations of osteological research populations in the 1990s, 25% of studies were able to employ new methodologies and 62% reached new results (1996). Although it is impossible and perhaps unethical to retain everything excavated, this illustrates the necessity of the recording of processes, sampling, and documentation as a site is being destroyed.

Even when ostensibly kept for study, much is lost through negligent curation and politics. The remains of the newly discovered species Homo floresiensis were essentially stolen and severely damaged, most likely by the rival scientists who “borrowed” them (Vergano, 2005). The resulting poor preservation of the bones, along with the contamination sustained during initial excavation, prevented conclusive DNA study of the remains when later challenges of their significance arose (BBC, 2008). This is hardly an isolated incident: museums frequently lose or wrongfully deaccession artifacts (Nikkhah, 2009; Morris, 2012). Political instability can also result in looting of “secure” archaeological sites and museums, or wholesale destruction such as Palmyra and other Syrian sites are currently
enduring (Shahseen, 2015). With such possibilities looming, it is not enough to assume that the material culture will be there forever and to sample without thorough documentation and publication.

In addition to unforeseen advances and unforeseen destruction, the idea of “relevance” has the potential to turn the cutting-edge theory *du jour* into an embarrassing historical footnote: in the 1950s, craniomorphometrics were a popular study resulting in the selective sampling of skulls from archaeological sites, with the purpose of proving (non-existent) racial inequalities (Harrison, 1995; Rose *et al.*, 1996; Collins Cook, 2006; Buikstra, 2006; Breckenridge, 2014). Cremated remains were once considered “useless” (Buikstra, 2006). Unwrapping mummies at salons or looting them for papyri was once a fashionable and “scientific” pastime, which current Egyptologists now bemoan for the data lost (Bahn, 1984; Brier, 1994; Moshenska, 2014). Collecting expeditions selectively gathered objects from living groups throughout the world, both failing to secure rigorous data, and souring relations for future generations (Breckenridge, 2014). Examples abound in classical archaeology, such as dynamiting through stratigraphic layers at Troy and modifying artifacts to resemble modern expectation of what the culture was like, or the interpretation of sites to fit Biblical themes (Lapatin, 1999; Fagan, 2014). Even in speaking of the Civil War period, Shackel has acknowledged the changing of memories of historical events as priorities and prevailing beliefs change (2001). Yet in some areas of the world, it is still common to dig through an “uninteresting” historical layer, or deprioritize historical finds because everything is believed to be understood from records. This has been observed in historic cemetery excavations, such as St. Nicholas Sevenoaks, in which it was the wish of researchers to get down to the “important” Pre-conquest structure (Boyle, 2015). Arguably, the rise of Cultural Resource Management (CRM) or “rescue archaeology” has watered-down methodology even in the modern world, effectively deprioritizing the study of sites which are desirable for commercial interests (Connah, 1998; King, 2005).

Clearly, when destroying irretrievable archaeological sites, it is not enough to consider what is of interest to archaeologists now; it is unknown what will be possible or important to future generations (King, 2005). Bahn has made the point about ethics in burial excavation that even “…until recent times no one can have foreseen that people in the future would take an archaeological or anthropological interest in burials” (1984, p 214). Carefully recording archaeological activities and sometimes “collecting data for data’s sake” remains indispensable; it is arguably what unifies the schools of archaeological thought (Kosso, 1991). This may be daunting or incomprehensible to theoretical archaeologists who, often possessing a humanities background, are not equipped with the basic knowledge of the sciences to collect, interpret, or even recognize the importance of many types of data (McGovern, 1995).
Unfortunately, the deprioritization of empirical data takes the profession back to square one: belief unsubstantiated by data is religion, not science. As with science and religion, there is much to be gained from a dialogue between schools of thought such as bioarchaeology, history, archaeology, theory, philosophy, science, and sociology (Kosso, 1991). Unfortunately, although bioarchaeologists have always vocally espoused collaboration, the historical trajectory of the field has been one tending toward isolation in labs and engagement with only the harder sciences (Buikstra & Beck (eds.), 2006). Goldstein has lamented the lack of integration of bioarchaeological research with archaeological theory, particularly suggesting that it would be one means of supporting the new “emotive” archaeology espoused by Tarlow and Meskell (2006). Physical anthropologists have also been self-critical for ignoring “…archaeological data because physical anthropology has gotten complicated and requires such specialized training that researchers do not have time to do everything they have to do for their specific analysis, plus work with the archaeological data…” (Goldstein, 2006, p 378). In order to bring some of these seemingly discords into harmony, Middle-Range theory has been suggested (McGovern, 1995).

Middle-range theory is not exclusively an archaeological concept, but rather a means of crafting theories which emphasizes the utilization of available data to address meaningful but manageable questions. Importantly, such a compromise is meant to prevent both the tedious refusal to imbue data with meaning by theorizing about it, and the fictionalization of the past by enthusiastic story tellers who find facts constraining (Kosso, 1991). McGovern aptly summarizes the limits of science and the dangers of unchecked speculation: “Archaeological interpretations will never achieve the same level of confidence as those in the natural sciences- there are far too many interacting and unknowable factors to assess- but by making testing procedures explicit, archaeologists and natural scientists can share a common ground and language of scientific inquiry. Fuzzy archaeological thinking, of course, may continue to thrive, because its effects are not as immediately obvious as in the natural sciences where, for example, bridges fall and rockets explode if a theory or its application is incorrect.” (McGovern, 1995, p82)

Indeed, Buikstra has discussed the ways in which poor data collection in early bioarchaeology have confounded later studies. Graham Morton has been offered as an example: when critics of his conclusions regarding the mound building Indians arose, he was compelled to equivocate, “because his skulls had been procured without detailed archaeological information…” (Buikstra, 2006, p8-9). In contrast, the Hemmenway expedition is praised as much more culturally and behaviorally nuanced than previous studies: “…securing and saving every bone…The result of their painstaking is one of the finest and most complete collections of ancient skeletons ever brought together.” (S. Baxter, quoted in
Buikstra, 2006, p15). In addition to meticulous methodology, it was the unification of different perspectives generated by different disciplines that has been attributed as the coup of the expedition. Ironically, the records linking specific remains to contexts were lost to negligent curation during the historic period (ibid.).

With this thinking in mind, the scattered data of the past is witnessing a homecoming, and recording techniques, a renaissance. Alongside the venerable tradition of cultural anthropology, a new generation of archaeological scientists are arising (McGovern, 1995; Rose et al., 1996; Larsen, 1999; Buikstra & Beck, 2006). Bioarchaeology, the scientific analysis of biological materials and particularly human remains; and archaeometry, the metric analysis of archaeological topics, have become established branches of archaeology in the past few decades (ibid.). Technical sub-disciplines and specialities in bioarchaeology and archaeometry such as human and faunal osteologists, ceramologists, and lithic specialists are increasingly common, and they continue to ask increasingly technical questions. Archaeologists with backgrounds in chemistry source lithic materials with chemical footprints, study the chemical composition of bone, find stable ways to preserve artefacts in perpetuity, and develop new dating methods. Those with biological inclinations study strains of tuberculosis from archaeological ribs, use 3-D modelling to expand the accessibility of research collections, or use CT technology to investigate mummies without destroying them. Those with demographic backgrounds create predictive models of cultural behaviours, evaluate the mathematical significance of specific hypotheses, or conduct comparative studies of population trends based in empirical data rather than feelings (Rose et al., 1996).

Such studies may seem esoteric or isolated in their utility to those whose primary interest is a holistic and emotive understanding of what life was like in the past. But it is precisely the sum of these small questions that brings the big picture into focus, and it is only careful recording that makes it possible to answer such questions as they arise. Of her 2011 work Ritual, Belief, and the Dead in Early Modern England, Tarlow states that the goal was to treat “disposal of the body as the focus of enquiry rather than a source of evidence for other questions.” (p 5). The current work seeks to address the opposite yet complementary goal of refining the study of the body so that it may be better used as a source of evidence. It also is an attempt to “pull together observations” and to “cross international borders” to study a specific aspect of post-medieval burials (Tarlow, 2015 b, p 2). In the new APABE guidelines for historic cemetery sampling, it has been observed that “Historically, the discipline of human osteoarchaeology has moved from studies focusing on a small number of “interesting” skeletons (usually those with unusual diseases) toward problem-orientated work with an emphasis on the patterning of data at a population level.” (Mays et al. 2015, p 5). The current research is undertaken with
this in mind. It takes the form of a demographic study, creating a dataset which is useful to taphonomists, demographers, historians, archaeologists, and medical professionals. It also takes the form of a computational survey of historic cemetery excavations themselves.

In the subdiscipline of human osteology within a cemetery excavation, if demographic data is not recorded, then it will never be possible to study the composition and mortality of the population (Buikstra & Ubelaker, 1994). Comparison with dates of death derived from tombstones or other sources enable the study of family arrangement in burials, seasonality of epidemics, commemoration of certain individuals, and numerous other questions (see Swedlund & Herring (eds.), 2003). A combination of careful recording of preservation, depth of burial by age, soil chemistry, and hydrology could resolve the question of skeletal preservation owing to extrinsic or external factors (Buckberry, 2000; Lewis & Gowland, 2007). Even if not immediately tested, properly collected soil samples can be studied for the presence of parasites, some historic diseases such as small pox, stomach contents, chemicals common to historic medicines, pollens indicating the seasonality of burial, botanical remains indicating the presence of flowers or coffin filling, and insects or microfaunal remains which would be interesting for the study of taphonomic processes. Acts as simple as the careful measurements, photography, and illustration that should already be standard in archaeological methodology have the potential to answer questions about burial position and the physical taphonomic processes which affect remains (Duday, 2006, 2009). This is only a fraction of a fraction of the questions which may be answered by current research in a single subdiscipline. As such, any question which can be answered by archaeological means is inexorably tied to the quality of the original excavations.

**HISTORICAL ARCHAEOLOGY: Those Who Do Not Study It Are Doomed to Repeat It.**

“One important thread of continuity .... is the sort of casual dismissal, bordering on disrespect or disregard, for what should be the primary archaeological task: adequately accounting for- that is, reconstructing and, as best we can, explaining- an ever-expanding, never complete material culture record.” –Kohl, 1993

In the course of this research, historic remains and historic cemeteries were the main focus of inquiry. Much as archaeology is an “orphaned science”, historical archaeology is an outsider within the archaeological sub-disciplines (Shackel & Little, 1992; Connah, 1998). There are two primary causes of this. First, historical archaeology falls within the reach of living memory (Tarlow, 2011). Second, much of its material culture, including written record, is ubiquitous in our world (Shackel & Little, 1992; Connah, 1998). For these reasons, it may seem that it is already more or less completely understood, and
that anything which is not currently understood can simply be “looked up” should anyone care to ask. For this reason, there can be something of a methodological division within the field, with archaeological technique reserved for the study of more ancient populations, while the historical study of records is often believed to be sufficient to understand recent populations (ibid.). Shackel and Little in particular have suggested that post-processual archaeology is ideally suited to make historical archaeology “relevant” because it is so steeped in documentary sources (1992).

This introduces two problems: is recent history actually understood? And if it is not, does anyone need or want to know about it? Though archaeologists have proffered many highfalutin justifications for the existence of archaeology in general, (i.e. those who do not study history are doomed to repeat it) the value of the profession most arguably lies in simple human fascination. Combining elements of science, history, art, and literature, archaeology tells us the story of ourselves (Bahn, 1984). Like any story, even if it is an important morality tale to the storyteller, it will be forgotten if it puts the listener to sleep. Compared to more well-publicized archaeological mysteries, the day to day lives of one’s own great-grandparents’ may seem dull as dirt. But this will not necessarily always be the case.

With recent history, too, the argument that it is “all known” is a straw man. The focus of archaeological research on developing new theories in modern decades values the variety of interpretations precisely because of the understanding that people may project or obscure their beliefs via material culture in a variety of deceitful, confusing, inconsistent, self-conscious, or even oblivious ways (Patterson, 1990; Shackel, 2001). Tarlow has referred to these as the “simultaneous occurrence of contradictory and incoherent practices” (2011). Marginalized groups may not have an obvious or self-generated material culture. The material culture of nonmarginalized groups may be obscured by intentional propaganda, or dissonance between what is believed and what is presented. Complex or thoroughly internalized views may not ever be demonstrated in a way that is clear from casual outside observation. Finally, many quotidian aspects of any culture are not intentionally presented at all. Although many have lauded tombstones as a type of source with dates and personal information neatly forthcoming (e.g. Tarlow, 1999; Mytum, 2006), because of their complex interaction with memory and social status, projections may be particularly distorted in burial monuments (Shackel, 2001). As history has shown, archaeologists are not even always successful at escaping their own cultural biases as they try to interpret past groups (Tarlow, 2011).

A discussion of the development of historic record keeping itself illustrates the principle that there are cycles between what is asked, understood, hidden, and retained (Herring & Swedlund, 2003). During the development of the British census, the priorities of the census were driven by the priorities of
the government, but the methodology was colored by the interests of the heads of the census (Jolly, 2013). Though the first National census was taken in 1801, it was not for another 40 years that individual names were included. This data point is what now enables the genealogical research that is part of a billion-dollar industry, participated in by millions (McGee, 2014). Furthermore, these crucial names were not a piece of data that was necessary at the time they were taken: the goal was more pertinently to establish the ages, professions, and genders of individuals in a household (Jolly, 2013). Other categories like religious attendance, specific professions, and medical data about the disabled were not primary inclusions either. They were only added when it was realized that “important” questions were going unanswered. These questions came to be considered significant only when a religious group, a statistician, and a physician respectively became the head figures in the census (ibid.).

Even during the taking of the census, it was recognised that many flaws were distorting the accuracy of the findings. Some of these included unclear instructions, absenteeism during harvest days, resistance of many participants, illiteracy, double-counting of individuals who attended multiple church services were the censuses were taken, and even the artificial inflation of numbers because some census takers mistakenly believed they were being paid by the head (Jolly, 2013). The methodology of the census was therefore a self-consciously evolving process to better address these issues. Some problems were never resolved in the historical period. Vagrants, for example, or thorough records of those living in temporary dwellings like house boats, do not exist. Those who migrated or were born into the household, but who died between censuses, disappear without explanation. Other classes like branches of the military were recorded separately and the survivability of their records vary. Others have noted that comparative studies may be restricted because such written records are often localized to urban areas and favour the elite (Tarlow, 1999).

The survivability of documents is a separate issue. Records burn. Records mould. Records become lost (Jolly, 2013; Wilkes, 2013). Because early British censuses were taken in pencil, many simply are now too faded to be useful (Jolly, 2013). A large percentage of Irish vital records were intentionally destroyed by the government (Grenham, 2006). The result is a partial set of documents, with partially accurate information, about part of the possible demographic questions, for part of one population, for a tiny part of human history. Censuses are just one example. The same principles and pitfalls hold true for other written sources, vital records, and tombstones (Wilkes, 2013). For example, though parish registers have been in use since 1538, civil registration in England did not begin until 1837. Schofield and Wrigley have demonstrated the reliability of burial records as a source of infant mortality in England until the 1700s, after which unbaptised children supposedly began to be under-
enumerated (1989). Tombstones may be rearranged or destroyed, removing their utility for linking the information with archaeological data (Tarlow, 1999). Unlike national censuses, other sources tend to be more variable in quality, patchier in coverage, and even more difficult to access. Nor does one record always, or even usually, fill the gaps left by another; the data chronicled is only as good as the question asked, the methodology used to retrieve it, and the providence through which it is preserved. Although such written sources are tremendously useful and researchers are quite lucky to have them, the idea that the answers to historical questions can always be looked up is simply a fallacy.

While archaeology is not perfect either, it provides a supplementary source for filling these gaps. Unfortunately, because of facile reliance on records and written history, even where the excavation of historic sites takes place, there may be a sense that basic methodological corners can be cut because certain factors are already known (Boyle, 2015). An example of this pertaining to historic cemeteries would be eschewing analysis of grave depth compared to original surface due to the conventional folk-knowledge that people were buried “six feet deep” (Gittings, 1984), and even if they were not, little of importance could be gleaned from the truth. Osteological studies of human remains may be hastened or not carried out because of the erroneous perception that the tombstone already provides all necessary age, sex, and familial data. Failure to study coffins and grave shafts as though they are three-dimensional objects with an original construction and a measurable reaction to the burial environment may occur (Duday, 2006, 2009), because they are not as elegant as other types of material culture.

In addition to answering fascinating questions about the historic period, it is precisely because of the presence of records and the opportunity to engage in a non-speculative understanding of material culture, that historical cemetery archaeology is so valuable to the wider profession. Herring and Swedlund’s volume Human Biologists in the Archives provides many examples of the possibilities such studies open (2003). Historic cemeteries are unusually large osteological datasets which were interred in ways which are at least vaguely understood. The composition of their populations is in many ways visible in records. Family relationships are often partially understood from tombstones. Because of such factors, historical sites are a brilliant testing ground for archaeological methodologies and assumptions.

Larsen has summarized three of the basic questions which may be addressed in bioarchaeology. These are 1) quality of life 2) behaviour and lifestyle and 3) biological relatedness and population history (2006). Obviously, these questions are very broad, literally encompassing hundreds of possible subqueries which may be answered by any human skeletons on one level, and skeletons particularly from historic cemetery excavation on another (Brothwell, 1981; Buikstra & Ubelaker, 1994). Because of complimentary records, osteological studies in historic cemeteries can be used to test and develop new
aging and sexing techniques, or at least inform more closely at what age or due to which factors the current ones begin to fail. Metric data used to prove cultural affiliation are one area which is still in development, and the reliability of morphological techniques is also variable (Relethford, 2003). The addition of large osteological samples whose racial background is known could expand the precision of this technique. To this end, stable isotope and DNA studies can show status and migration where material culture is insufficient (Herring & Swedlund, 2003). Such studies have rarely been conducted on a large scale, and could be used to trace the many diasporas of the United States.

From vital records, osteological recording, and biological tests, individuals who died of certain diseases can be found. Population growth and the ravages of epidemics can be seen through demography (Madrigal, 2003). Did those who suffered brief stints of fatal diseases have osteological hallmarks on their remains? Or in the so-called survivors’ osteological paradox, is it those who had a long bout of illness which they survived, who seem to have osteological evidence of the disease (Buikstra & Beck, 2006)? How did disease travel through the household? Through the community (Sattenspiel, 2003; Sawchuck & Burke, 2003)? Can evidence of wet-nursing or apprenticing situations be correlated with disease avoidance/exposure? Did certain religious groups evade certain diseases, suggesting perhaps isolation or differential medical access and hygienic practices (Ruttiman & Loesch, 2011)?

If family relationships are known and correlated to specific burials from inscriptions and vital records, then the spatial organization of cemeteries can be studied. General period-related questions about segregation or arrangement by age, family, race, and date of death can of course be answered. From a wider perspective, how commonly do osteological and dental non-metric traits really occur in families (Buikstra & Ubelaker, 1994)? Are they sex linked? How reliable are current estimates of the incidence of those traits by race? Furthermore, were burials grouped together by year suggesting expediency or epidemic? If epidemic, at what time of year did they occur? How common are different congenital conditions (Buikstra & Beck, 2006)? Did those who had congenital diseases manifest the disease according to the records, and if so how were they treated by the community? Such information about the survivability of epidemics and the prevalence of disease within families could arguably even be used to help modern clinicians identify lineages with disease resistance or prevalence.

Historic cemeteries provide a wealth of material for the study of preservation (Brothwell, 1981; Buikstra & Ubelaker, 1994). At the most basic level, they can be used to develop a reliable and transferrable preservation metric (Brickley & McKinley, 2004). If depth of burial is known and preservation is well recorded, then the discipline-wide problem of whether preservation correlates with depth can be answered definitively (Buckberry, 2000). If factors such as soil acidity and drainage are
studied in concert with preservation, questions about external factors affecting preservation can be explored. Where precise position of individual elements is studied as Duday has suggested, even more of these factors can be understood, such as the effects of relative bone density, size, and element by age (2009). If year of death is known along with preservation, then it can be shown whether preservation is linearly progressive and predictable. Because historic cemeteries are such large samples, the effects of preservation by age and sex could finally be resolved (Grauer, 2003).

Such questions are groundbreaking. At their most basic level, they are “good archaeology”: arguably all part of the tapestry that constitutes a thorough professional study of the time period and populations in question (Buikstra & Ubelaker, 1994). At a higher professional level, they have real potential to expand the ability of archaeologists to speak to questions about the ancient past by resolving methodological conundrums which cannot necessarily be determined using ancient populations alone. Better osteological techniques, more thorough understanding of preservation, and a better comprehension of the similarity of the demographic composition of the dead population compared to the living one are useful to the study of any buried population (Herring & Swedlund, 2003).

Finally, on a broader cultural level, such studies are potentially interesting to other professionals and members of the public. The expansion of data in historic populations is undoubtedly fascinating and useful to the millions of Americans and Europeans who seek to trace their ancestry (Grenham, 2006; Jolly, 2013; Wilkes, 2013). Historians ought to be interested in the discrepancies between records and material culture as they carry out their own research, since these can help them arrive at a more objective picture of the past. With better knowledge, the importance of certain historical sites, events, and peoples may be revealed: this has the potential to alter the culture of the present in the monumentalization and development of tourism surrounding past sites (Shackel, 2001). Understanding of ancient disease patterns and bone chemistry can potentially be used in modern medicine to save lives today. Questions comparing archaeological datasets to archival datasets are not merely stimulating, they are vital.

Unfortunately, the data-gathering necessary to truly address such questions is part of an onerous and recursive process: one question often generates another and none of these questions can be understood without a basic, but difficult-to-tabulate, understanding of the composition of buried populations. It has been remarked that early physical anthropologist Ales Hrdlička concerned himself with a seemingly simple question: “What are the variations of man?” while leaving the more “interesting” queries of “how?” and “why?” to his successors (Buikstra, 2006). Yet at the time, to ask “how” or “why”, before the basic observation of “what” had been generated, would have to put the cart
before the invention of the cart, let alone the horse. Almost a century later, we still do not have the full answer to Hrdlička’s simple question.

**ART & LIES: Debunking One Paradox At a Time.**

It was with such possibilities in mind that the current study was envisioned. Throughout the field of archaeology, many long-held misconceptions exist, particularly regarding infants and children (Perry, 2005). In 2009, the present author attempted to address an often-stated assumption in the ancient world: because the Egyptians were ostensibly a child-loving culture as projected in their art and literature, they must not have practiced infanticide. Their Greek and Roman neighbours, by contrast, were “known” to have practiced extensive infanticide, as their texts spoke so vocally about it (Murphy, 2009). In addition to the illustrating how these assumptions based on text, art, and other social projections were far from the truth about ancient infanticide (i.e. just because Egyptian texts prized happy families, did not mean that all children were wanted equally; and just because Greek and Roman texts spoke about “exposure” did not mean that infanticide was practiced to the extent or in the ways that historical and modern scholars often believed), when reviewed osteologically, very little data for children and infants could be found at all.

What arose as an attempt to study the taboo of infanticide, evolved into a study of infant mortality in the ancient world, which evolved into a fascination with the question: Are infants really “missing” from archaeological populations at all? Upon further investigation, it was revealed that very little factual evidence for infant mortality rates in archaeological populations existed (Acsadi & Nemeskeri, 1970). Ancient excavations, as it turned out, seemingly made such a poor effort of recording children and infants that many questions about them were not possible to explore with archaeological populations (Murphy, 2009). However, it was not clear 1) whether children were actually absent, 2) why they might be absent, and 3) if absent, how many were missing.

Infants and children are two of the least studied groups in biological anthropology (Perry, 2005). In general, data for them can be difficult to obtain, and interest in them has until recently been low (ibid.; Djuric et al., 2011; Lally & Moore (eds.), 2011; Thomas, 2005; Gottlieb, 2000; Kamp, 2001; Hirschfeld, 2002). Two further obstacles in particular have prevented their investigation. The first of these is the fact that archaeologists frequently assume that fertility was unrestricted and infant mortality was universally “high” in cultures without access to modern birth control (Sainz de la Maza Kaufman, 1997; Caldwell, 1996; Caldwell & Caldwell, 2003; Lewis & Gowland, 2007). To some extent, knowledge of historical sanitary and medical practices, studies of indigenous populations, and model life tables indicate that
assuming greater mortality is common sense (Caldwell, 1996; Coale & Demeny, 1983). However, this statement is frequently made without any qualification as to the variation, extent, or causes of this supposedly heightened mortality. Furthermore, the interaction of fertility levels with mortality is often ignored (Lewis & Gowland, 2007).

By contrast, it is rare for archaeologists to detect a large cohort of infants in excavated cemeteries (Djuric et al., 2011; Walker et al., 1988). While Coale and Demeny have suggested that 40 - 50% of mortality is typical of pretransition populations in the first year of life (1983), archaeologists such as Buckberry have found some excavated populations to display 9.7% or less under the age of five (2000). This is essentially never assumed to reflect an accurate mortality profile; instead it is usually argued that numerous infants are missing from burial assemblages. Taphonomic factors or the skill of the excavators are most commonly implicated (Walker et al., 1988; Guy et al., 1997; Scott, 1999; Buckberry, 2000; Baker et al., 2005; Smith & Avishai, 2005; Morton & Lord, 2006; Mays et al., 2012). It is also frequently contended that infants and young children may have been subject to different funerary practices (ibid.).

These unqualified generalizations do an injustice to children in history and the field of archaeology. While these suggestions are not outlandish, none have been empirically confirmed or quantified. In fact, in at least two comparisons of a partially excavated cemetery with vital records, the age and death structures of the population from records and skeletal samples have been found to coincide (Lanphear, 1989; Grauer & McNamara., 1995). In another study, the number of infants recovered actually exceeded the number documented in records (Saunders et al., 1995). On the other hand, if these studies are not representative of the norm and children are typically treated differently in the burial context, how exactly were they being treated? If there are so many buried somewhere, why haven’t researchers found them?

Initially, the research sought to study three aspects of Judaeo-Christian groups of European descent from locales in Europe, North American, and Australia during the period from ~ 1600 - 1900 AD. By comparing completely excavated cemeteries of homogenous religious and ethnic background to associated burial records, it was hoped that 1) ranges of infant mortality could be reliably established 2) rate of loss of infants in the burial environment could be approximated 3) causes of mortality and taphonomic loss could be hypothesized by assessment of local environmental factors and living conditions at each site and 4) the results could be compared to archaeological populations of greater antiquity to shed light on living conditions in the ancient past. These aims necessarily altered as the scope of the project narrowed and changed. They were revised primarily to address major obstacles that
arose due to the quality of excavated cemetery reports, adding the following questions A) Which data as compared to standard archaeological technique are currently deficient in historic cemetery reports and B) If data is missing, what are some of the causes and possible amendments to current archaeological practice that might rectify this?

By turning to historic samples, it was hoped that the initial set of questions could be easily resolved. At the most basic level, two data points are necessary to determine whether infants are lost. These are actual ages of the buried population at death, and precise ages of the burial population upon recovery. By comparing these figures between sites, if loss is in fact occurring, it would be possible to state whether there appears to be a regular rate of loss. In theory, this data should be retrievable from parish burial records in the first instance and from osteologically analysed cemeteries in the second. Drawn from the western world, the populations, ought to have minimized the possible noise from genetic, behavioural, and environmental variables that might complicate such a study.

Historic records, were thought likely to be superior to ancient records in their extent, recording, and survivability. It also seemed probable that historic cemeteries, excavated by recent archaeologists with the most up-to-date methodologies and expertise, would be more thorough compared to ancient sites which underwent a longer period of potential disturbance and excavation by early antiquarians before modern osteological techniques were in use. It quickly became apparent that those who do not learn from history are doomed to repeat it.

As with the ancient populations studied for osteological evidence of infanticide, historic cemetery reports often inexplicably neglected the accurate aging of the buried population. Because of this, well under half of the total reports obtained were unsuitable for purpose. Accessing historical records which could be meaningfully linked to specific sites was likewise difficult. Finding either historical records or archaeological reports often required expensive and time-consuming physical travel to separate archives. Once there, the data contained might prove to be uncatalogued, insufficient, or non-existent. In the case of burial records, it often required transcription and translation. Rather than being a trivial hurdle resulting in a diminished study, this was seen as systematic of a greater methodological problem in archaeological practice.

As the discipline of archaeology evolves it becomes more difficult to exclude demography and the study of infants and children. The fertility of a population, as well as its infant and child mortality, can be an indication of the society’s hygiene, medical acumen, reproductive and rearing practices, access to birth control, access to nutrition, allocation of resources, possession of technology, views on infanticide, mobility, political control over family life, views on family and personhood, and other
questions which ought to be of interest to archaeologists (Baxter, 2005; Lewis & Gowland, 2007). Modern studies have shown that, even where they are high, fertility and infant mortality may vary by society, depending on such factors (Lewis & Gowland, 2007; Palloni, 1980, 1981). Therefore, if infant mortality may be understood with greater precision, archaeologists will be empowered to explore these and other interesting topics. However, in order to study infant mortality in archaeological populations, demographic data must first be routinely recorded. As one of the most basic tenants of osteoarchaeological analysis, it is incomprehensible that this data is not already included as a matter of course in large-scale excavations of burial populations, which by their nature are primarily osteoarchaeological. The failure to do so is symptomatic of a larger deficiency within field archaeology, especially in the United States. This deficiency, long sensed but rarely articulated by practitioners of CRM (King, 2005; Boyle, 2015), extends far beyond the failure to record demographic data; it is an ethical question of whether we as archaeologists are truly capable of routinely implementing our own basic methodology, and if we cannot, whether we have any right to disturb the dead at all.
Chapter 2: Research Design

ORIGINAL RESEARCH DESIGN:

To assess the original questions surrounding the utility of studying the demography of archaeological infant mortality, reports of excavated historic cemeteries, as well as local death and burial records from the three regions were gathered for study. The period in question, 1600-1900 AD was selected because vital records became increasingly standardized and available at its beginning (Jolly, 2013; Wilkes, 2003). The demographic transition which took place in western countries at the end of this period witnessed fertility and mortality shifts that brought the mortality rates to the lower figures familiar today (Chamberlain, 2006). Age at death and preservation of remains by age were the two primary data points sought from each population. The number, condition, and age structure of the burials recovered were to be compared where possible to regional census overviews as well as local demographic information taken from parishes or other available sources in the area. This was studied to yield a more accurate mortality profile against which the extent of bone loss by age, climate, excavator specialization, and burial type could be assessed. Comparisons to Model West life tables and basic statistical tests were used to test the reliability of the data (Coale & Demeny, 1983). After individually studying each population’s mortality, samples were grouped in different ways to explore the potential variables affecting mortality, preservation, and recovery. These included such aspects as climatic region, sample size, use-period of the cemetery, year of excavation, length and quality of reporting, whether the excavation was primarily commercial, and socio-economic background of a population.

Several important issues lead to the selection of the time periods, localities, and groups in this study. Numerous factors may influence both the original levels of infant mortality in a society and the appearance of infant mortality at excavation, after alteration by environmental and man-made forces (TABLE 1). Detailed analysis of all variables is essentially never attempted, because it would be impossible to control for all of them. This may be mitigated to some extent by controlling for ancestry, limiting the diversity of burial practices within study populations, grouping populations by geo-climatic region, knowing the time period the burials come from, and selecting communities for which the social circumstances may be scrutinized.
Table 1: Factors Affecting Infant Mortality, Preservation, and Retrieval (Chamberlain, 2006; Duday, 2006, 2009; Buikstra & Ubelaker, 1994)

<table>
<thead>
<tr>
<th>Factors Affecting Mortality</th>
<th>Environmental Factors Affecting Preservation</th>
<th>Cultural Factors Affecting Preservation</th>
<th>Factors Affecting Retrieval/Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertility</td>
<td>Temperature</td>
<td>Bone Density: Genetics</td>
<td>Surface Preservation of Cemetery</td>
</tr>
<tr>
<td>Hygiene</td>
<td>Soil pH</td>
<td>Diet</td>
<td></td>
</tr>
<tr>
<td>Prenatal/Pregnancy Behaviors</td>
<td>Soil Type</td>
<td>Pathology</td>
<td></td>
</tr>
<tr>
<td>Birthing Practices</td>
<td>Annual Precipitation</td>
<td>Delay between death &amp; burial</td>
<td></td>
</tr>
<tr>
<td>Weaning Practices</td>
<td>Animal Activity</td>
<td>Embalming, disembowelling, or cremation</td>
<td></td>
</tr>
<tr>
<td>Access to Medical Care</td>
<td>Root Activity</td>
<td>Depth of burial</td>
<td></td>
</tr>
<tr>
<td>Access to Birth Control/“Wantedness” of Children/Infanticide</td>
<td>Mould/Microbial Activity</td>
<td>Use/type of burial containers</td>
<td></td>
</tr>
<tr>
<td>Time/Monetary/Care Investment in Children</td>
<td>Length of Burial</td>
<td>Inclusion of grave goods</td>
<td></td>
</tr>
<tr>
<td>Dietary Stresses</td>
<td>Seasonality of Burial</td>
<td>Inclusion of Total Population</td>
<td></td>
</tr>
<tr>
<td>Environmental Stresses</td>
<td>Cemetery Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epidemics, Famine, &amp; Disaster</td>
<td>Cemetery Design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internecine &amp; Internal Conflict</td>
<td>Specific Bone Element Size &amp; Density</td>
<td>Use/Permanence of markers</td>
<td>Number of Excavators/Time Spent Excavating</td>
</tr>
<tr>
<td>Mortality Risk to Parents/Access to External Care Networks</td>
<td>Erosion/Destruction of Cemetery Features</td>
<td>Cemetery organization</td>
<td></td>
</tr>
</tbody>
</table>

The 1600s-1900s is an ideal time period to explore. During these years, reliable demographic records began to be standardized through the increased implementation of church records and censuses (Hollingsworth, 1968; Lewis, 2002; Lewis & Gowland, 2007; Ruttiman & Loesch, 2011). This enabled the comparison of documented mortality and burial data with observable figures derived from the existing osteological research. Furthermore, historical accounts of the time period meant that even where migration was present or stresses were high, they could be anticipated and adjusted for. Previous studies in this area have tended to investigate groups or time periods which were “interesting” or easily accessible (Hassan, 1981; Walker et al., 1988; Lanphear, 1989; Swedlund & Herring, 2003). This is problematic because few populations from periods prior to 1600 have reliable records with which to compare the mortality rate, age structure, or rate of decomposition from the skeletal data (Hollingsworth,
1968; Walker et al., 1988; Lanphear, 1989; Lewis, 2002; Swedlund & Herring, 2003; Lewis & Gowland, 2007). Without an understanding of actual mortality by age and date, the percent of the population “missing” from an archaeological assemblage, or the rate at which they have disappeared, cannot be hypothesized reliably (Konigsberg & Frankenberg, 1992). Where the total number of burials is completely unknown, or where cemeteries have been discovered accidentally and partially excavated during construction, sampling may be inadequate (Gordon & Buikstra, 1981; Hassan, 1983; Boddington, 1987; Walker et al., 1988; Perry, 2007). Additionally, the population structure may be skewed by unknown migration or stresses in ancient or marginalized groups (Hollingsworth, 1968; Lanphear, 1989; Weiss & Wobst, 1973; Hassan, 1983; Grauer et al., 1995; Lewis, 2002; Chamberlain, 2006; Higgins, 2003).

Selecting genetically-linked populations from differing geographic regions was desirable because cultural behaviours, internal bone composition, and environmental factors may affect the preservation of bone in the burial environment. Owing to extensive colonization leading up to this era, populations of European descent now represent somewhat genetically and culturally homogenous descendent groups in disparate environments. Previously, most studies have confined themselves to a single locality, which has limited researchers’ comprehension of the impact of localized variables (Walker et al., 1988; Lanphear, 1989; Grauer & McNamara., 1995; Lewis, 2002; Lewis & Gowland, 2007; Buckberry, 2000). A combination of soil composition, pH, temperature, moisture, and oxygenation are the extrinsic factors responsible for the speed of decomposition of bone (Fazekas & Kosa, 1978; Acsadi & Nemeskeri, 1970; Gordon & Buikstra, 1981; Henderson, 1987; Mays, 1992; Child, 1995 a & b; Guy et al., 1997; Buckberry, 2000; Nielsen-Marsh & Hedges, 2000 a & b; Archer, 2004; Jans et al., 2004; Nielsen-Marsh et al., 2007; Carter et al., 2008, 2010; Mays, 2008; Daniel & Chin, 2010; Fernández-Jalvo et al., 2010; Djuric et al., 2011). Speed of decomposition also varies by climate, as well as by the differential burial practices that facilitate or delay contact with the elements.

The size and chemical composition of individual bone is also thought to have an effect on preservation (Von Endt & Ortner, 1984; Price, 1989 a & b; Guy et al., 1997; Nielsen-Marsh et al., 2007; Turner-Walker & Jans, 2008; Djuric et al., 2011). Although dietary factors leading to disease and poor bone density may differ between geographically distant populations (Sillen, 1989), it was hoped that studying groups of similar descent would limit some of the variability in any intrinsic factors responsible for the diagenesis of bone.

Finally, predominantly Christian populations were chosen because of the relative scarcity of excavated burial grounds from other religious backgrounds. Catholic institutions proved to be one of the
most reliable sources of early records. Although it has been stated that Catholic cemeteries were more likely to exclude unbaptised infants (Lewis & Gowland, 2007; Rüttimann & Loesch, 2012), comparison with parish records during this study appeared to contradict this (Thiel, 2012). The addition of potential mortality or diagenetic differences between different ethnic groups and the use of cultures which practiced widely different burial customs were avoided. Homogenous burial practices are important because placement in the burial environment, including depth and the likelihood of post-depositional movement based on factors like shroud-wrapping, coffin collapse, and burial flooding, is another factor which may have substantial impact on the preservation of bone (Duday, 2006, 2009). It was believed that to include heterogenous groups would introduce too many variables to this incipient study.

While all the populations involved in this study practiced interment, it would be worthwhile to compare the taphonomy of their cemeteries to that observed in Jewish burials, which historically forbade embalming and left the body partially in contact with the earth. Protestant and often Catholic ritual, by contrast, promotes the prolonged preservation of the body, especially as embalming was popularized (Brothwell, 1987; Chapman, 1987). This followed slightly different trajectories in the US and the UK: embalming became fashionable following the Civil War in the United States, and rose to a greater popularity in the modern day following the invention of formaldehyde in 1867, while in England it arguably popularized to a lesser extent as one aspect of the Victorian funeral, which necessitated logistical delays because of the elaboration required (Mitford, 1963; Gittings, 1984; Matson, 2012). From a natality/mortality perspective, it should also be useful to assess different religious groups, as health and sanitation may differ between them (Rüttimann & Loesch 2012), as well as preferred family size, contraceptive practices, and breastfeeding behaviours. It would be ideal to study a wide variety of genetic and religious affiliations in various climates. Future scholars are encouraged to extend the research to include more descent groups, religious communities, and environments.

**AMENDMENTS TO RESEARCH DESIGN:**

As the project progressed, the original scope was narrowed, and altered to address the challenges posed by the seemingly poor state of methodology in archaeological reporting. The first limitation arose when the location of excavated cemetery reports proved to be more challenging than initially thought. In Australia, Canada, and Europe, only a handful of suitable reports could be identified and actually accessed. While often standardized and formally published in the United Kingdom, many United States excavation reports existed solely as grey literature. This necessitated first knowing that a report existed without the convenience of a library catalogue, and locating an individual who could provide a copy of
it. The content of such reports was highly irregular. Even where a publication existed, many types of data, including the demographics necessary for the original research design, were often inexplicably omitted. As a result, rather than determining whether infants were “missing” from the archaeological record, it was first necessary to determine why historic cemetery excavation reports appear to be “missing” from the archaeological record, despite the frequent relocation of historic cemeteries.

More than simply capturing the desired data from a report or record, it had to be manually tabulated, calculated, and binned into useful categories for comparison and analysis. This took the form of a large database containing thousands of data points of names, ages, sexes and other potentially pertinent information like seasonality, cause of death, or burial place. Once binned, individual mortality for each site or records was compared with model life tables before restacking to compare between sites, regions, and broad age categories. In spite of the difficulties presented in locating excavation reports, specific demographic data enabling the study of infant mortality was retrievable from genetically and culturally homogenous populations for 73 excavated cemeteries in the United States and the United Kingdom.

Figure 1: An image of one database of parish records, illustrating the data points collected

A second major hurdle was then encountered in the collection of complete and accurate parish records which could be reliably associated with cemeteries. Although many such records exist, accessing them frequently required physically travelling to an archive. Five data collection missions to archives yielded parish record information for small subpopulations of England, Australia, New Mexico, and Arizona. Because of the aforementioned difficulties with excavation reports, it was not always possible
to link such data sets together in a meaningful way. Ultimately, the direct comparison of burial records to excavated cemeteries was scaled back as overly time-consuming and unproductive. The demographic data taken from excavation reports were retained, as well as the linkable demographic information already retrieved from parish records. This was used in a diminished version of the original intended study to explore the viability of the method and estimate whether the demographic data derived from the remainder of excavation reports might be plausible. The geographic focus was thereafter restricted to the United States and the United Kingdom.

Initially, it had been hoped that between 50 and 100 excavated cemeteries could be surveyed and compared with their own burial records in order to make a statistically meaningful sample responding to the question of whether infants were missing, and if so, to what extent. In the first 1.7 years of research, a survey of full mortality profiles in the available suitable archaeologically excavated populations had been completed, as shown in Table 2 (Cemeteries N=109; Individuals N=9,757). The mortality profiles of three cemeteries (Alameda Stone, Tucson, AZ; St. Benet Sherehog, London; and Voegtly Cemetery, Pittsburgh PA,) as compared to the mortality records derived from parish records was also accomplished. Three further New Mexico cemeteries (Seven Rivers, Santa Fe; Kearny Road, Santa Fe; The TVI Site, Albuquerque; Abeyta Street, Mesilla Dona Ana) had been compared to regional parish records which were not directly associated with the cemeteries themselves (Immaculate Concepcion, Albuquerque.
N=106; San Felipe de Neri, Albuquerque, N=231; Nuestra Senora de Belen, Belen N=423; St Francis, Santa Fe N=476). The small sample size of these sites and indirect correlation with the parish records

Table 2: Cemeteries and Records Surveyed within the First 1. Years of Study

<table>
<thead>
<tr>
<th>Site</th>
<th>N Osteological Sample</th>
<th>N Burial Records</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alameda Stone, Tucson AZ</td>
<td>1,166</td>
<td>5,099</td>
</tr>
<tr>
<td>St. Benet Sherehog, London</td>
<td>230</td>
<td>1,513</td>
</tr>
<tr>
<td>Voegtly Cemetery, Pittsburgh PA</td>
<td>546</td>
<td>814</td>
</tr>
<tr>
<td>Seven Rivers, Santa Fe NM</td>
<td>45</td>
<td>231</td>
</tr>
<tr>
<td>Kearny Rd, Santa Fe NM</td>
<td>25</td>
<td>476</td>
</tr>
<tr>
<td>The TVI Site, Albuquerque NM</td>
<td>38</td>
<td>106</td>
</tr>
<tr>
<td>Abeyta St, Mesilla Dona Ana NM</td>
<td>9</td>
<td>423</td>
</tr>
</tbody>
</table>

however, made them of less use than initially hoped. The resulting data had also been compared experimentally to the mortality profiles taken from a sample of Prehistoric British populations (Cave Systems N=186, Causewayed Enclosures N=91, Cairns & Barrows N=728) of unknown original mortality in order to assess what applicability the information about infant loss might have for ancient populations, if further substantiated. In nearly all cases, the small sample size of the excavated populations studied was partially a result of the unexplained omission or uncertainty surrounding age data from the total population.

This left the option of expanding the study in one of two directions. These were to either focus on an in-depth study of the small number of suitable populations which could be identified and investigated within the timeframe of the project, or to address the larger research problem of why archaeological reports were still omitting basic data in the modern day, resulting in the thwarting of this and other possible research questions. It was considered that the second research goal was more pressing for several reasons.

Firstly, it was estimated that given the unforeseen limitations of the scope of data collection, if the original course of research was adhered to, the resulting sample size of populations comparing excavations to parish records would be ten or less. While the in-depth discussion of the mortality of those populations might be a fascinating read, and significant to a deepened appreciation of those specific sites, the larger goal of contributing to computational research in archaeology would not be achieved. In previous mortality studies comparing records to excavated sites, the results have always been similarly promising but modest. They have also come to conclusions in accord with those reached within this body of work. As such, achieving a marginally larger sample size was not likely to answer the original research question much more definitively than the existing sample from the present study already had.
Furthermore, because some of the more interesting underlying questions regarding these populations, such as cause of death were not included in all records, the sample sizes for possible intersite demographic questions were even smaller. Comparative studies of other demographic data like fertility rates would likewise entail extensive additional research of birth records or censuses. Such data collection would have posed the same challenges and presumably progressed at the same rate as the initial projects.

Secondly, the author’s previous attempts to resolve analogous questions in ancient populations was met with difficulty for similar reasons: namely a deficiency in the archaeological data, and misconceptions about what is known or easily accessible from reports. In ancient populations, excavated largely by earlier archaeologists who perhaps lacked the scientific foundation to record the necessary data, the deficiency was excusable. It is less easily explained in excavations which have taken place over the last few decades. Assumption, even when innocent, is a bane to scientific research, leading scholars blindly down the wrong avenues. This may result in the restatement of falsehoods as truths, sometimes for many years, until the archaeological evidence against them finally becomes overwhelming. Alternately, assumption of what data ought to be in an archaeological report or record may lead to cul-de-sacs of wasted time. This time is not wasted, however, if these avenues are way posted by those who have already explored them. This study provided a much-needed opportunity to way-post one such dead end and suggest a new path forward.

It is not only this issue of infant mortality in the historic period, or even the bigger question of how many infants are likely to be lost within any burial population that is at stake. Many research questions and many fundamental archaeological techniques have the potential to be improved through the study of historic cemetery excavations, as explained in the preceding sections. As such, the second goal of evaluating and working towards the improvement of excavation methodology in historic cemeteries was prioritized above the possibility of making more modest headway in the narrower question of absolute taphonomic loss of infants.

The following volume explores and resolves the original research questions of infant mortality, establishing one of the most comprehensive studies of archaeological mortality profiles compiled from a particular period (Appendix C). The resulting figures and ranges of mortalities are indispensable to anyone studying historic mortality patterns, the sites, or the time period the cemeteries come from. This study further resolves the debate of whether the loss between initial mortality and retrieved mortality is actually greater for infants than for other age groups. By comparing the figures on infant mortality and
the rates of loss to older populations, it is established that this knowledge is instrumental in judging the accuracy of the mortality of very ancient populations, for which records cannot be used.

Secondarily, this study seeks to quantify the ways in which reports are currently deficient compared to standard archaeological methodology. A gazetteer of the North American cemeteries used in this report, or known to the author (Appendix B) has been compiled to complement the British gazetteer of Cherryson and colleagues (2012). The critique of such reports is done not as a data collecting exercise, but in the hopes that the methodology for excavating historical sites can actually be developed to more closely resemble what should already be customary. In addition to the quantitative aspect of what is currently missing, it is necessary to consider why something that ought to be fundamental according to standard archaeological technique is allowed to be so variable in practice. Without a knowledge of what it lacking, it is impossible to suggest what may be improved and how.

THE FOLLOWING VOLUME:

The first paper presented, “Fifty Shades of Gray Literature: Deconstructing ‘high’ infant mortality with new data sets in historic cemetery populations.” is the largest survey of infant mortality in excavated historic cemetery populations to date. It compares the ratio of infants to children to adults in excavated UK and US cemeteries, as well as studying age-specific mortality profiles compared to Model West life tables for sites where precise aging techniques had been utilized. This paper establishes statistical differences in infant mortality in disparate socioeconomic regions, while elucidating which factors appear to have the greatest impact on skeletal retrieval rates. While the limited number of parish records precluded a full study of absolute loss by age in cemetery populations from these sites, these figures were experimentally established to be small for a partial dataset using the available parish and excavation records.

The two intermediate papers in this volume incorporate many aspects of the original research design using the available excavation reports and parish records. The original experimental basis for this project is laid out in “Lost, But Not Alone: Determining absolute taphonomic loss by age in historic cemetery populations.” This paper studies the absolute and proportional loss of different age groups at three of the historic cemetery populations which both exhibited excellent recording and best correlated with historical records to address the question of whether infants necessarily seem to be missing in archaeological assemblages. In addition to looking at the regularity of mortality profiles in different cemeteries, this upholds the findings of the few earlier studies in this area that infant remains are not necessarily lost at a much greater rate than those of adult and child (Lanphear, 1989; Lewis, 2002; Lewis
While answering one portion of the original research question, more work was possible on overall historical mortality rates in general, or the applicability of historic studies to more ancient populations.

This absolute loss between burial and recovery was further explored in “Looking Forward to Look Back: How investigations of historical burial populations can inform our interpretations of Prehistoric burial practice.” This paper compares the experimentally derived difference between the mortality displayed in excavation reports and parish records from a US and a UK cemetery, to the mortality from sixteen British Neolithic burial sites of three types: barrows/cairns, causewayed enclosures, and caves. This validates the hypothesis that studies of recent populations, such as these, may be used to shed light on the practices of older cultures. In this case, the study compares a number of excavated prehistoric populations whose burials seem to display a plausible, possibly original mortality, to other prehistoric sites with less plausible mortalities for which taphonomic or burial customs appear have a greater influence. The author contributed the historical demographic data and analysis to this research, while Andrew Chamberlain contributed the Neolithic data.

The issues surrounding the quality and accessibility of cemetery excavations in the US were explored in the fourth paper presented in this volume. “Publishing the Perished: Uniform collection standards and the future of cemetery excavation in the United States” sought to quantify the type and quality of data presented in 109 United States cemetery excavation reports. Therein the collection methods and presentation of osteological and archaeological data were assessed, by comparison to the standard methodologies developed by Buikstra and Ubelaker (1994); Brickley and McKinley (2004); English Heritage (2004, 2005); and Mays and colleagues (2015). The reports were evaluated on the binary or tripartite inclusion of data in five categories and sixty subcategories similar to those noted by Reeve (1998) to quantify the extent to which such projects were falling short of professional archaeological standards. This is one of the most comprehensive overviews of known excavated cemeteries in the US, as well as the most thorough attempts to study such reports in a measurable way. Including many types of archaeological data and a broader sampling of populations than the other papers, this work creates a framework for the remainder of the study.

The fifth paper, “Hollowed Ground: Where destruction becomes respect in bioanthropology”, touches on the legal framework of historic cemetery relocation and explores the public perception of the practice in the media. Because of limited academic publication, and monetary factors preventing an earnest and open professional discussion of the state of CRM, media portrayals were one of the few
sources that offered any explanation for the seemingly counter-intuitive treatment of relatively modern burials in the United States. As elucidated by the research resulting in the preceding sections, both professional standards and popular opinion of archaeological excavation differ substantially between the US and UK. By understanding the socio-political and economic concerns that have given rise to current data collection strategies, practices may be improved upon and regulated. Ideally, awareness of the types of information such datasets can foster when correctly collected, will fundamentally alter the practice of historical cemetery excavation and the perception of their value.

The final paper presented here, “Shouting to Wake the Dead: Is it time for a Historic Graves Protection Act?” assesses the coverage provided by the Federal and state laws that may protect historic cemeteries in the United States. State law is currently the primary force guarding the more than 300,000 disused historic cemeteries in the United States: its effectiveness is highly uneven, depending on whether a given state’s laws focus on protecting cemeteries, archaeological resources in general, or Native resources only. This work explores the methods and regulations which have been effective in yielding sound archaeological research and providing protection to historic cemeteries, and which have failed in these endeavors.

Together, these papers seek to explore the original questions regarding infant mortality and taphonomy in historic populations. In answering these questions, more questions are raised, regarding the reliability of emerging archaeological data as a whole. The result is an analysis of the current work in historic cemeteries, particularly as it relates to our treatment, study, and ultimately, our respect for the remains of our own dead. In relation to the dead, respect is both an action and a noun, a personal conviction and a professional ethos. As the following volume will show, the search for answers to our own academic questions is inseparable from an evolving, self-critical awareness of our research techniques.
Chapter 3: Literature Review

INTRODUCTION:

When approaching questions as overarching as historic infant mortality, the preservation of infant remains in cemetery populations, and the collection standards for such types of data in historic cemeteries, numerous areas of background research must first be addressed. To reach a basic understanding of the previous research in historic infant mortality and its relationship to taphonomy, these include a grounding in concepts surrounding vital population statistics and the physical and chemical changes that affect human remains in the burial environment, as well as a review of the preceding studies related more closely to the research question. A discussion of these topics will provide the reader with an idea of the necessity of the research, as well as some of the potential challenges posed.

DEMOGRAPHY:

"I know what A. E. Housman said about the sort of exercise I am about to engage in: 'Everyone has his favourite study, and he is therefore disposed to lay down, as the aim of learning in general, the aim which his favourite study seems specially fitted to achieve, and the recognition of which as the aim of learning in general would increase the popularity of that study and the importance of those who profess it.' But we are not talking about favorites here but about the survival of the very capacity of human beings to read their pasts and, indeed, their presents and thus to preserve a measure of their humanity." (Pollock 2009. p935)

Demography, the discipline necessary to study these questions, is the study of population statistics (Hassan, 1981; Chamberlain, 2006). Like the study of children, demography has been underutilized in archaeology, with detractors claiming that the incomplete nature of archaeological cemeteries, population censuses, records, funerary inscriptions, and similar sources render it useless or even detrimental (Hollingsworth, 1969; Petersen et al., 1975; Bocquet-Appel & Masset, 1982; Van Gerven & Armelagos, 1983; Engels, 1984; Buikstra & Konigsberg, 1985; Lanphear, 1989; Meindl & Russel, 1998; Frankenburg & Konigsburg, 2006). Although not without limitations, multivariate statistics enable archaeologists to compare multiple potentially relevant variables in complex datasets and quantify significance in figures that they have tended to describe in vague, emotive terms: for example, the unqualified statement that infant mortality is “high” (Schultz, 1973; Hassan, 1981; Meindl & Russel, 1998). Quantifying Archaeology and A Bayesian Approach to Interpreting Archaeological Data are two manuals which outline the use of relevant statistical methods by which archaeology may be studied (Buck et al. 1996; Shennan, 1997).
Historical demography emerged as a discipline in the late 1800s (Acsadi & Nemeskeri, 1980; Hassan, 1981). The study of demography in relation to biological anthropology was popularized by the 1960s thanks to early researchers including T. W. Todd, E. A. Hooton, H. V. Vallois, F. Weidenreich, and J. L. Angel (Hassan, 1981). Many works such as Fekri Hassan’s *Demographic Archaeology* have focused on prehistoric populations (1981; Acsadi & Nemeskeri, 1970), or Roman data from textual sources (Russel, 1958; Acsadi & Nemeskeri, 1970; Bagnall & Frier, 1994; McKechnie, 1999; Scheidel, 2001). Reservations about sampling and the inscrutable nature of ancient data has increasingly led researchers to recognize the value of combining archaeological and textual sources, rather than prioritizing one or the other (Lewis, 2002; Herring & Swedlund (eds.), 2003; Lewis & Gowland, 2007; Perry, 2007; Photos-Jones *et al*., 2008).

In this capacity, the techniques of demography have great potential to be useful, if scholars maintain awareness of the potential downfalls such as sampling biases and population suitability (Schultz, 1973; Perry, 2007). Andrew Chamberlain’s work, *Demography in Archaeology*, acts as a manual, providing an introduction to demographic concepts and their applications in the field (2006). Of particular relevance are Chamberlain’s standard recommendations for the study of fertility and mortality in stable populations through the use of model life tables and hazard functions. Recent studies have tended to integrate such techniques to investigate data in one of three ways: archival or monuments research (Russell, 1958; Bagnall & Frier, 1994); bioanthropological inquiry (Guy *et al*., 1997; Buckberry, 2000; Lewis, 2002; Lewis & Gowland, 2007); or the combined study of archaeological and archival data sets (Acsadi & Nemeskeri 1970; Lanphear, 1989; Walker *et al*., 1988; Grauer & MacNamara, 1995).

Because of early interest in Greco-Roman sources, heavily textual studies are still the most numerous. In 1958, Russell was one of the first to attempt a large scale of study ancient populations via textual methods. He endeavoured to assess the normalcy of the population structure from Roman funerary monuments, compared to the Domesday Book, the poll tax, and the extents and inquisitions post-mortem (*ibid*.). The result is one of the best early estimates of preindustrial population (Acsadi & Nemeskeri, 1970). In a similar vein, Bagnall and Frier analysed the Greco-Roman census to explore factors such as migration, age at marriage, fertility, and mortality (1994). One of the largest problems with this data set was the suspected under-aging of male children to avoid the poll tax, and the poorly understood interaction of rural to urban migration and the slave trade (*ibid*.). Despite the overall success of this work, it is difficult to compare to bioanthropological data in Egypt because of the tendency of Egyptologists to assign vague age categories to skeletal assemblages (Murphy, unpublished thesis).
Increasingly, archival sources have been used to study epidemiology, human growth, conflict mortality, and other population stressors in a variety of archaeological and ethnographic populations (Swedlund & Herring (eds.), 2003). Such studies are becoming more common with the advent of electronic databasing, which allows archives to be easily shared. Recognizing the limits of textual data, more projects have also undertaken successful comparisons of skeletal and written sources (Walker et al., 1988; Lanphear, 1989; Lewis 2002; Lewis & Gowland 2007; Grauer & MacNamara, 1995)

In what is still one of the most comprehensive studies to date, Acsadi and Nemeskeri overviewed the subject of human mortality and compared figures from earlier sources to bioanthropological data from medieval Poland and Hungary (1970). They provide a thorough discussion of demographic techniques relating to the study of the human lifespan and in particular focus on problems specific to cemetery research, including sampling issues, the accuracy of various bioanthropological aging techniques, and statistical methods for dealing with the data. Noting ubiquitous issues with incomplete or inaccurate source data, they cautioned researchers to be mindful of six factors:

1) Whether the series included is complete, and if incomplete, what limitations to expect
2) How accurate is knowledge of age at death and sex data, or to what extent is it estimated
3) How accurate is archaeological data relating to the records and what factors have contributed
4) Fulfilment of demographic requirements of population stability etc.
5) Adoption of demographic methods suitable to the question
6) Uniform approach in carrying out work

Particular notice of infants and children was taken in their work, touching on such subjects as the effects of fertility on population structure, the ways infant mortality has been estimated in past studies, differential treatment of children’s burials, and what they perceive as the spurious argument that children are more likely to vanish without a trace due to taphonomy (ibid).

It is not without reason that studies of that scale are rarely undertaken. In addition to the onerous amount of data collection a comparison of bioanthropological and archival data requires, there are several major difficulties with textual research. Written sources may range from funerary inscriptions, census data, tax histories, medical histories, parish records, family records, diaries, journalistic accounts, propaganda, to literature (Hollingsworth, 1968; Acsadi & Nemeskeri, 1970; Bagnall & Frier, 1994; Perry 2007). The more reliable of these such as censuses sometimes have the advantage of providing fairly inclusive records. However, like cemeteries, many archives are “accidental datasets” (Swedlund & Herring, 2003). They may be incomplete, incorrect, or illegible owing to typographic error, recorder
negligence, respondent resistance, loss, deterioration, limited scope of collection, or a lack of interest in specific data (Hollingsworth, 1968; Acsadi & Nemeskeri, 1970; Swedlund & Herring, 2003; Perry, 2007). There is a tendency among statisticians or respondents to round age categories to the nearest 5 or 10-year mark. Elderly individuals may be overaged to appear more venerable. Females, children, or the elderly may be under-enumerated because they are “not important” to the aims of the data collection (Bagnall & Frier, 1997). By contrast, the taxable and the draftable may be purposefully hidden. Finally, averages taken from large datasets like country-wide censuses may not tell the story of a particular subset being studied, whether that of a family group, or a region (Newman, 1906; Bagnall & Frier, 1994). For this reason, breaking down the population by reliable regional records has real value which is not often tapped. In light of all these potential pitfalls, it becomes even more necessary to have a secondary source such as a skeletal population with which to compare data.

**Infant Mortality, Past & Present:**

Mortality is the number of people within a population who will die at a specific age (Chamberlain, 2006; Hassan, 1989). Fertility is the number of children a woman will have in her lifetime (Hirschman, 1994). Each is influenced by a staggering number of factors, which interact to manipulate infant mortality. Fertility can be altered or limited by age at menarche, parental interrelatedness, parental age, maternal health and behaviours, seasonality, congenital and reproductive diseases, male infertility, age at first marriage, access to birth control, and environmental stress (Douglas, 1966; Potter, 1966; Stycos & Weller, 1967; Menken, 1985; Rutter & Quine, 1990; Thomson et al., 1990; Van de Walle, 1992; Dodoo, 1993; Acheson, 1994; Bagnall & Frier, 1994; Riddle, 1996; Dorsten et al., 1999; Kramer & McMillan, 2006). Mortality is affected by age, disease, nutritional and occupational stress, hygiene, access to medical resources, intergroup cooperation and care of the sick, intrapersonal conflict, and the environment (Goodman & Armelagos, 1989; Chamberlain, 2006; Lewis, 2002; Lewis & Gowland, 2007; Lee, 2010). Population crowding affects both mortality and fertility (Weiss & Smouse, 1976), with a detrimental impact on infant survival (Newman, 1906). Even within a modern society, it is difficult to comprehend all factors fully, let alone quantify them.

Infant mortality is defined as the proportion of live-born individuals who die in their first year of life, usually expressed as numbers per thousand (Acsadi & Nemeskeri, 1970; Chamberlain, 2006; Lewis & Gowland, 2007). In modern industrialized nations, infant mortality has decreased steadily from the 1950 and has been 10 per 1000 or less since 1999 (Monnier, 2001). In the US, it stabilized around 7
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from 2000-2005, but was as low as 3.5 in countries like Japan and Sweden (Matthews & MacDorman, 2007; Kuehn, 2008). Rates are still dropping gradually: by 2011 Sweden had fallen to 2.1, while the US still lingered at 6.6 in 2010 (DOI, 2012). In less developed countries, rates between 120-100 per thousand or higher may still be found, owning to the prevalence of malnutrition, poor hygiene, and unchecked epidemics (Barbieri, 2001). Statistics from Industrialized Nations are presented in Table 1.

When the first year of life is further broken down, a trend can be seen, with most infant deaths occurring within the first days of life (Table 2). This is apparently not a new trend. Newman found that around 50% of infant deaths in England and Wales from 1888-1901 occurred within the first 3 months of life (Newman, 1906, p 13). Mortality in childhood is lower than mortality in infancy. It drops and stabilizes around the age of 4, with accidents becoming increasingly implicated over illness (Acsadi & Nemeskeri, 1970).

With this wide range of figures even in relatively recent times, what constitutes “high” infant mortality? Some have claimed that infant mortality was as high as 36% in post-medieval London and 26% in London prior to the 16th Century (Lewis & Gowland, 2007). Others have asserted that in any historical population “…infant mortality rates under 150 per thousand [15%] are scarcely credible,” (Hollingsworth, 1968, 418), or that rates below 30% in an archaeological population are biased (Buckberry, 2000).

Wrigley and Schofield, writing about mortality in England from 1550-1800 found variation between mortality spikes in gender as well as age group, with mortality rising most dramatically between 1700 to 1749 (Wrigley & Schofield, 1989). These figures are presented in Table 3. While much higher than at present, even these historical figures are lower than the 30% or more which has been posited for archaeological populations, and display ample variation. Particularly interesting is the mortality in the 1 – 4- year-old group, which underwent an anomalous rise in female death from 1650 - 1700. Also interesting is the fact that child death, while not reaching the same heights as infant mortality typically rose and fell in tandem with it.

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* 1998 Data Not Available
### Table 2: Infant (<1) Mortality (per thousand) by Country in the First Year of Life in 1995, from UN WHO Statistics in Monnier, 2001 p 7402

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<th>Late Neonatal (Day 8-27)</th>
<th>Post-neonatal (Day 28- end of the 1st year)</th>
<th>Infant (Total)</th>
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### Table 3: Infant and Child Mortality Rates from (qx) from 12 Reconstitution Studies (simple means) (Wrigley & Schofield p 249)

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</table>
In 1906 Newman published contemporary medical and mortality statistics extending from the 1830s to 1905, analysing the effects of crowdedness, country, county, and illegitimacy on infant mortality (Table 4). From 1901-1905 infant mortality within England ranged from 91-163 (9-16%) by county. Infant mortality also varied substantially by country, from 81 in New Zealand to 212 in Hungary in 1903. Over time mortality diverged: Norway’s rate was 104 from 1874-1883, Ireland’s was 96 from 1883-1892, while England still had a rate of 132 in 1903. Highest of all was Chile, ranging from 297-352 from 1883-1903 (ibid.). While such figures are all substantial compared modern infant mortality rates of ~3-10, they exhibit wide variation. The cumulative observation of mortality from Newman and from Wrigley and Schofield’s studies show infant death ranging from about 12-16% for around 350 years in England, while other countries showed infant deaths at as much as twice these numbers even in the later periods.

Looking at studies of another country in the time period from 1750-1820, Rüttimann and Loesch (2012), Imhof (1990), Perrenoud (1979), Schelbert (1989), Francois (1978; quoted in Rüttimann & Loesch, 2012), and Reust (1980, quoted in Rüttimann & Loesch, 2012) researched vital records from various cities throughout Europe. Their findings are compared in Table 5. Mortality also ranged widely, with rates over five times higher in German Protestant city of Memmingen ($q_0=0.459$) than in Hamburg ($q_0=0.078$). By contrast, infant mortality in London was 341 from 1725–1749, 151 from 1825–1829, and 162 from 1839–1844 (Newman, 1906; Lewis & Gowland, 2007). Cause of mortality also appeared to differ widely between these studies. Rüttimann and Loesch found that in Bern, the highest cause of infant death was “cramps” or “convulsions” (75.3%), and the secondary causes of death were gastrointestinal disease (8.2%), and finally debilitation and emaciation (3.1% each). Newman found that in 1904, wasting diseases were the primary cause of death in England and Wales during the first year at 45.79%, diarrheal diseases were second accounting for 31.87% of deaths, and convulsions were third, with only 13.65% of deaths. Although the aetiology of “convulsions” is unknown, they may represent epileptic tonic seizures, and neonatal tetanus which may be contracted when the umbilicus is not severed antiseptically (Ruttiman & Loesch, 2012). These results appear to indicate very different environments, one with poorer birthing practices, and one with poorer post-natal care and nutrition accounting for infant death.
Table 4: Infant (<1) Mortality (per thousand) by Country 1883-1903 From Newman, 1906 pg. 6

<table>
<thead>
<tr>
<th>Country</th>
<th>1883-1892</th>
<th>1893-1902</th>
<th>1903</th>
</tr>
</thead>
<tbody>
<tr>
<td>England &amp; Wales</td>
<td>144</td>
<td>152</td>
<td>132</td>
</tr>
<tr>
<td>Scotland</td>
<td>120</td>
<td>127</td>
<td>----</td>
</tr>
<tr>
<td>Denmark</td>
<td>135</td>
<td>133</td>
<td>----</td>
</tr>
<tr>
<td>Russia</td>
<td>270</td>
<td>272*</td>
<td>----</td>
</tr>
<tr>
<td>Germany</td>
<td>----</td>
<td>195**</td>
<td>----</td>
</tr>
<tr>
<td>Prussia</td>
<td>207^†</td>
<td>199</td>
<td>194</td>
</tr>
<tr>
<td>Austria</td>
<td>----</td>
<td>227***</td>
<td>----</td>
</tr>
<tr>
<td>Hungary</td>
<td>----</td>
<td>224</td>
<td>212</td>
</tr>
<tr>
<td>Netherlands</td>
<td>176</td>
<td>152</td>
<td>135</td>
</tr>
<tr>
<td>Belgium</td>
<td>161†</td>
<td>157</td>
<td>155</td>
</tr>
<tr>
<td>France</td>
<td>167</td>
<td>158</td>
<td>----</td>
</tr>
<tr>
<td>Spain</td>
<td>----</td>
<td>190^</td>
<td>----</td>
</tr>
<tr>
<td>Switzerland</td>
<td>160‡</td>
<td>145</td>
<td>133</td>
</tr>
<tr>
<td>Italy</td>
<td>209**†</td>
<td>173</td>
<td>----</td>
</tr>
<tr>
<td>Chile</td>
<td>297 ^†</td>
<td>333</td>
<td>352</td>
</tr>
<tr>
<td>Ireland</td>
<td>96</td>
<td>104</td>
<td>96</td>
</tr>
<tr>
<td>New Zealand</td>
<td>87</td>
<td>82</td>
<td>81‡‡</td>
</tr>
<tr>
<td>Norway</td>
<td>97</td>
<td>94</td>
<td>----</td>
</tr>
<tr>
<td>Sweden</td>
<td>108</td>
<td>99</td>
<td>----</td>
</tr>
<tr>
<td><strong>AUSTRALIAN COMMONWEALTH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.S. Wales</td>
<td>117</td>
<td>111</td>
<td>110</td>
</tr>
<tr>
<td>Victoria</td>
<td>122</td>
<td>109</td>
<td>106</td>
</tr>
<tr>
<td>Queensland</td>
<td>123</td>
<td>103</td>
<td>120</td>
</tr>
<tr>
<td>S. Australia</td>
<td>103‡‡</td>
<td>106</td>
<td>97</td>
</tr>
<tr>
<td>W. Australia</td>
<td>125‡†</td>
<td>146</td>
<td>141</td>
</tr>
<tr>
<td>Tasmania</td>
<td>104</td>
<td>93</td>
<td>----</td>
</tr>
</tbody>
</table>

* 1890-1899 From 1867-1878 Russian infant mortality was 266
** 1901-1902
*** 1895-1900 From 1866-1883 Austria had an infant mortality of 255
^ 1900-1902
†† 1885-1892
† In Belgium from 1867-1883 it was 148
‡ From 1869-1880 it was 195
*† 1872-1882
*‡ 1885-92 From 1881-85 it was 134, and in the decennium 1871-80, 149
†† 1886-92
‡‡ In 1904 the rate was 71, to which it had fallen from 107 in 1871-75
### Table 5: Infant & Child Mortality by City, Habitat, and Religion 1750-1820, from Ruttiman & Loesch 2011, p 62

<table>
<thead>
<tr>
<th>City</th>
<th>Infant Mortality (q 0)</th>
<th>Child Mortality (q 1-4)</th>
<th>Time</th>
<th>Habitat</th>
<th>Region/Religion</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamburg</td>
<td>0.078</td>
<td>0.097</td>
<td>1800-1820</td>
<td>Urban</td>
<td>German Protestant</td>
<td>Imhof 1990</td>
</tr>
<tr>
<td>Saarland</td>
<td>0.106</td>
<td>0.101</td>
<td>1800-1820</td>
<td>Rural</td>
<td>German Protestant &amp; Catholic</td>
<td>Imhof 1990</td>
</tr>
<tr>
<td>Bern</td>
<td>0.144</td>
<td>0.068</td>
<td>1805-1815</td>
<td>Urban</td>
<td>Swiss Protestant</td>
<td>Rüttimann &amp; Loesch 2012</td>
</tr>
<tr>
<td>Geneva</td>
<td>0.193</td>
<td>0.153</td>
<td>1790-1797</td>
<td>Urban</td>
<td>Swiss Protestant</td>
<td>Perrenoud 1979</td>
</tr>
<tr>
<td>Ortenau</td>
<td>0.200</td>
<td>0.113</td>
<td>1800-1820</td>
<td>Rural</td>
<td>German Protestant &amp; Catholic</td>
<td>Imhof 1990</td>
</tr>
<tr>
<td>Herrenberg</td>
<td>0.292</td>
<td>0.139</td>
<td>1800-1820</td>
<td>Rural</td>
<td>German Protestant</td>
<td>Imhof 1990</td>
</tr>
<tr>
<td>Freienbach</td>
<td>0.293</td>
<td>0.209</td>
<td>1790-1809</td>
<td>Rural</td>
<td>Swiss Catholic</td>
<td>Schelbert 1989</td>
</tr>
<tr>
<td>Offenburg</td>
<td>0.339</td>
<td>---</td>
<td>1750-1800</td>
<td>Urban</td>
<td>German Catholic</td>
<td>Francois 1978</td>
</tr>
<tr>
<td>Leipzig</td>
<td>0.300-0.400</td>
<td>---</td>
<td>1750-1800</td>
<td>Urban</td>
<td>German Protestant</td>
<td>Francois 1978</td>
</tr>
<tr>
<td>Wroclaw</td>
<td>0.300-0.400</td>
<td>---</td>
<td>1750-1800</td>
<td>Urban</td>
<td>Poland Catholic</td>
<td>Francois 1978</td>
</tr>
<tr>
<td>Landsberg</td>
<td>0.440</td>
<td>---</td>
<td>1750-1800</td>
<td>Urban</td>
<td>German Catholic</td>
<td>Francois 1978</td>
</tr>
<tr>
<td>Memmingen</td>
<td>0.459</td>
<td>---</td>
<td>1750-1800</td>
<td>Urban</td>
<td>German Protestant</td>
<td>Francois 1978</td>
</tr>
<tr>
<td>Lucerne</td>
<td>---</td>
<td>0.123</td>
<td>End of the 18th c.</td>
<td>Urban</td>
<td>Swiss Catholic</td>
<td>Reust 1980</td>
</tr>
<tr>
<td>Paris Region</td>
<td>---</td>
<td>0.184</td>
<td>1750-1789</td>
<td>Both</td>
<td>France Catholic</td>
<td>Reust 1980</td>
</tr>
</tbody>
</table>

Even this small glimpse into historical mortality illustrates two things. First, there are clearly differences in the levels and aetiology of infant mortality in historical populations, dependant on factors such as sex, date, location, and even religion. Typically, percent mortality in England ranged in the low to mid-teens from 1500-1900 according to the exploration of various historical mortality statistics (Wrigley & Schofield, 1989; Meckel, 1990; Newman, 1904): about half to a quarter of what has been assumed to be normal by archaeologists (Acsadi & Nemeskeri, 1970). Second, understanding cultural factors both may help explain the variation, and contribute to our understanding of the time period.

**Birth Control & the Fertility Transition:**

The “demographic transition” describes a period in which the overall fertility and mortality of a society is reduced, often concomitant with regulation of contraceptive practices via modern techniques (Douglas, 1966; Donaldson, 1991; Van de Walle, 1992; Hirschman, 1994; Mason, 1997). This takes the form of four stages, summarized by Chamberlain in Table 6.
Many works have been written on subtopics within demography including the effects of total fertility, weaning practices, family size, birth spacing, maternal health, marital status, parental investment, seasonality, epidemiology, wantedness, and gender on infant mortality in historical populations (Blake, 1981; Weller et al., 1987; Heaton, 1990; Hewlett, 1991; Weeks & Rumbaut, 1991; Caldwell, 1996; Wood, 1998; Sear et al., 2002; Hessol & Fuentes-Afflick, 2005; Hagan et al., 2006).

When individuals control their fertility, it is believed they can make a greater investment in wanted children, reducing infant and child mortality. Where fertility is unrestricted, it is assumed that resources will be insufficient to rear the resulting children, or that disease will eliminate many of them.

The use of birth control has been attempted since antiquity (Riddle, 1992). Despite arguments that fertility was high in pretransition populations, others have found that family size has varied enough that the cultural ideal of the time is usually approached (Preus, 1975; Westoff & Ryder, 1977; Johnson-Hanks, 2007). Fertility rates have been observed to range from 3.7-9.5 in 23 natural fertility societies (Sainz de la Maza Kaufman, 1997), and from 5-7 in a separate study (Acsadi & Nemeskeri, 1970). Although the mechanism for this is not always thoroughly understood, it has been shown that in addition to any chemical or mechanical birth control methods which may be available, delayed weaning and coitus interruptus can have significant birth-spacing effects (Jones et al., 2009; Becker et al., 2003).

Variation in fertility is important because the stretching of resources between more individuals can increase child mortality in a large family, leading to a quantity/quality trade-off (Blake, 1981; Hagan et al., 2006). However, high fertility should not necessarily be assumed to equate with high infant mortality. In modern studies of the Amish, infant mortality has been found to be comparable to the surrounding population, while fertility is much higher (Acheson, 1994). Very different skeletal assemblages would be expected in each population.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Death rate</th>
<th>Birth rate</th>
<th>Growth rate</th>
<th>Age Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low average age of living population, high proportion of children</td>
</tr>
<tr>
<td>2</td>
<td>Falling</td>
<td>High</td>
<td>High</td>
<td>Low average age of living population, highest proportion of children</td>
</tr>
<tr>
<td>3</td>
<td>Low</td>
<td>Falling</td>
<td>Falling</td>
<td>Increasing average age of living population, falling proportion of children</td>
</tr>
<tr>
<td>4</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High average age of living population, low proportion of children</td>
</tr>
</tbody>
</table>
Secondly, there is an assumption that as labour-saving technology advances, the living conditions of the population will improve and fertility will boom (Kramer & McMillan, 2006). This should be followed by a decline in both fertility and mortality (Donaldson, 1991; Kreidte et al., 1993). During such a decline, there is an increase of life expectancy which is usually derived from the increased survival of the very old and the very young (Newman, 1906; Acsadi & Nemeskeri, 1970). This is problematic in historical demography because, without examining the statistics to determine where the increase is occurring, the overall appearance may be one of a “healthier” population (Sattenspiel & Harpending, 1983; Woods, 1993). In reality, it is possible for life expectancy and infant mortality to increase simultaneously (Newman, 1906; Lewis, 2002; Lewis & Gowland, 2007; Gorsky et al., 2011). This may be because of influences such as pollution, occupational or nutritional stress, or shifting maternal investment as mothers join the workforce (ibid.).

As records do not extend to the time before the beginning of globalization and the last industrial spike, it is difficult to tell whether such mortality trends have always been the norm (Lewis, 2002; Lewis & Gowland, 2007). The eradication of epidemics through vaccination, or the “Jennerian Transition”, and the general improvement in medicine is thought to be responsible for modern reductions in mortality (Barbieri 2001; Monnier, 2001). Sterilization and hygiene is especially implicated in the prolonged survival of infants (Newman, 1906, Barbieri, 2001). However, there is a minimum population size necessary to carry epidemics (Sattenspiel & Harpending, 1983; Schnittker & Karandinos; 2010). Isolated groups may not have been exposed to the same extent before widespread migration enabled their rapid spread. Simple child-rearing behaviours, which can substantially influence infant survival, are also important (Holman & Grimes, 2001; Edmond et al., 2006; Rüttimann & Loesch, 2012). Differing and sometimes counterintuitive weaning practices have been observed in archaeological populations (Clark, 1981; Dupras et al, 2001). The use of fashionable baby formulas, for example, can introduce incomplete nutrition and germs through the use of bottles (Newman, 1906). Superstition and ritual may also result in fatally unsanitary or hazardous conditions (De Mause, 1974). Because the bulk of infant and child deaths are caused by disease and malnutrition, the extent to which a society reduces these risks is a necessary question to comprehend infant mortality.

**Studying Demography & Mortality in Historical Populations:**

Life tables are statistical models which express the mortality experience of different population types (Acsadi & Nemeskeri, 1970; Shyrock & Siegel, 1980; Chamberlain, 2006). The predecessors of contemporary life tables were used as early as 1662, from John Graunt’s study of the Bills of Mortality.
in the London parish registers (Acsadi & Nemeskeri, 1970). Developed in the 1940s, modern life tables help estimate the mortality experience and other factors of populations without consistent collection of vital statistics (Weiss & Wobst, 1973; Brass, 1996). They can also be applied to archaeological populations with unknown age structure, especially if any cohort appears to be missing (Moore et al., 1975; Boddington, 1987; Chamberlain, 2006). There are a variety of different model life tables which have been calculated from statistics from various populations and time periods (see Coale and Demeny, 1966; Le Bras, 1968; United Nations, 1982; Brass, 1996; Berkley, 2013). These differ from mathematical functions such as the Gompertz equation, in that life tables contain a large number of true parameters, but are able to depict the shape of mortality with only a few effective parameters (Acsadi & Nemeskeri, 1970).

Life Tables display the following variables, derived by comparing the number of deaths in a particular age cohort to the population as a whole.

\[ X = \text{Age Cohort at Death} \]
\[ D_x = \text{Number of Deaths within an Age Category} \]
\[ d_x = \text{Proportion of Total Number of Deaths within an Age Category} \]
\[ l_x = \text{Survivorship within an Age Category} \]
\[ q_x = \text{Probability of Death within an Age Category} \]
\[ L_x = \text{Average Number of Years an Individual Lives in Each Age Category} \]
\[ T_x = \text{Total Number of Years Remaining to Individuals Who Enter an Age Category} \]
\[ e_x = \text{Average Life Expectancy of an Individual Who Enters an Age Category} \]

In the majority of model life tables, each of these variables is calculated for a 5-year age category. When these figures are tabulated, a visual representation known as a survivorship curves may be graphed, depicting the probability of death within an age category (Chamberlain, 2006).

Generally, mortality is highest within the first year of life, with a large spike in the first month (Newman, 1906; Acsadi & Nemeskeri, 1970, Monnier, 2001). After the age of one, mortality drops quickly, stabilizes throughout childhood, and remains relatively low in most populations until around the age of 60. For studies of this kind, many life tables are inappropriate because mortality is so different in the 1-5-year age category, that any level of infant mortality will cause them to depict a sharp, undifferentiated drop in survivorship in the infantile phase of the resulting survivorship curve. It is necessary to use life tables which break down the first age category into one-year intervals, rather than the standard five (Feeney, 1980; Coale & Trussel, 1974; Brass, 1996). It is also helpful to subdivide the
first year into trimesters; however, this is not frequently feasible with skeletal populations because of the incomplete use or unreliability of aging techniques (Acsadi & Nemeskeri, 1970). Some of these methods, such as those devised by Brass (1996) or Feeney (1980) are unlikely to be feasible in archaeological groups because necessary statistics such as the total numbers of children born to women in different age groups may not be forthcoming. These might be practical, however, in the case of very good vital records. Caution must also be exercised because the overparameterization, or use of too many variables, can render life tables less statistically stable (Coale & Trussel, 1996).

Coale and Demeny and Coale and Trussell’s model life tables, gathered from over 300 modern and ethnographic populations, are the most widely used in archaeological demography, however Ledermann’s tables have also been used in studies of infant mortality (Guy et al., 1995). The Human Mortality Database tables, maintained by UC Berkley and the Max Planck Institute, contain mortality profiles from 37 world regions (Berkley, 2013). The earliest of these date back to the mid-eighteenth century, making them desirable for this study.

Ideally, the structure of an archaeological population for which some age and sex data exists can be matched to the appropriate life table, and inferences can be made about the lifespan and lifestyle of population present. In practice, it is usually assumed that archaeological populations match the “Model West” life tables drawn from ethnographic samples with high mortality, and in fact, Coale and Demeny’s tables are not suitable for use in populations with modern infant mortality lows (Chamberlain, 2006). This may have the unintended consequence of forcing a cemetery population into an unnatural mould of high mortality, particularly in tandem with the assumption of poor preservation (Acsadi & Nemeskeri, 1970; Boddington, 1987). For this reason, the Coale and Demeny tables, the Human Mortality Database files, and the infant life tables used by Coale and Trussel may be used for this project to approach the best fit. It is hoped that the use of parish and census records will approximate actual mortality for the populations studied, so that the applicability of the model life tables, and the most appropriate life tables to use can be assessed.

A second issue with the application of life tables to skeletal samples is that model life tables reflect stationary populations: that is, populations where the difference between the crude death rate and crude birth rate equal zero (Weiss & Wobst, 1973; Acsadi & Nemeskeri, 1970; Chamberlain, 2006). Unless some estimation of the total size of each age cohort can be made, only the mean age at death, not the death rate or expectation of life at birth can be reliably calculated from a nonstationary skeletal population with an unknown birth rate. This is because a skeletal assemblage contains only those who
have died at each given age, and does not reflect the proportion of those who have died at a given age with the number of people in their cohort who survived that age (Sattenspiel & Harpending, 1983). For this reason, cemetery populations are usually assumed to be stationary for the purpose of analysis, when in reality, such populations are rare (Weiss & Wobst, 1973; Sattenspiel & Harpending, 1983; Chamberlain, 2006). It is also necessary to assume that no migration is occurring or that immigration equals emigration. Such variations in cemeteries can be smoothed if the cemetery has been in use for a very long time (Weiss & Smouse, 1976; Sattenspiel & Harpending, 1983), however this type of smoothing may also obscure variations in mortality which are of interest to this study.

While calculation of the mean age at death is useful, researchers should be aware that it is not equivalent with expectation of life at birth. The use of local records should add a birth rate to the equation, allowing for the study of mortality rates over shorter time periods (Henry & Fleury, 1976 cited in Rüttimann & Loesch, 2011). Hazard functions, which “express the instantaneous risk of death as a continuous function of time,” (Chamberlain, 2006, 32), should also be possible to use in tandem with parish records where exact age at death is known. Together, it is hoped that a relatively accurate picture of a population’s mortality can be understood, so that the extent of preservation can be assessed.

TAPHONOMY:

Taphonomy is the study of the processes whereby bones alter from their original burial state or position. It can describe processes like animal scavenging, root infiltration, post-mortem crushing, and accidental shifting of the bone through burrowing or excavation (Fazekas & Kosa, 1978; Acsadi & Nemeskeri, 1970; Gordon & Buikstra, 1981; Von Endt & Ortner, 1984; Henderson, 1987; Price, 1989 a & b; Mays, 1992; Child, 1995 a & b; Guy et al., 1997; Buckberry, 2000; Nielsen-Marsh et al., 2000 a & b; Archer, 2004; Jans et al., 2004; Duday, 2006, 2009; Nielsen-Marsh et al., 2007; Carter et al., 2008; Turner-Walker & Jans, 2008; Carter et al., 2010; Daniel & Chin, 2010; Fernández-Jalvo et al., 2010; Djuric et al., 2011). Diagenesis is the process of chemical alteration of bone unto the point of the complete dissolution of its constituent components, or replacement and fossilization (Boddington, 1987; Garland, 1987; Price, 1989; Child, 1995; Nielsen-Marsh & Hedges, 2000 a & b; Jans et al., 2004; Nielsen-Marsh et al., 2007; Fernández-Jalvo et al., 2010). Many studies have been conducted on both of these topics, frequently focusing on animal assemblages (Klein, 1989; Andrews, 1995; Hollund et al., 2012), chemistry and fossilization processes (Von Endt & Ortner, 1984; Sillen, 1989; Willey et al., 1997; Nielsen-Marsh & Hedges, 2000 a & b; Stiner et al., 2001; Denys, 2002; Jans et al., 2004 Nielsen-
Marshall et al., 2007; Smith et al., 2007; Turner-Walker & Jans, 2008; Fernández-Jalvo et al., 2010), forensics (Mant, 1987; Archer, 2004; Morton & Lord, 2006; Carter et al., 2008, 2010; Ururahy Rodriges et al., 2008; Stokes et al., 2009; Ross & Cunningham, 2011; Ubelaker & Zarenko, 2011), and historical burial (Fazekas & Kosa, 1978; Henderson 1987; Waldron, 1987; Stojanowski et al., 2002; Bello et al., 2006). All of these subjects have some relevance to the question at hand, as well as salient differences which make their applicability tentative.

Faunal studies commonly deal with the dispersal and loss of specific elements. Animal remains may be selectively brought back to a site, and then discarded in nonstandard ways after having been processed or cooked (Klein, 1989; Willey et al., 1997). Often this differs from human burial, in which a body is interred whole in a casket with clothing and other objects, sometimes having undergone embalming or disembowelling (Fazekas & Kosa, 1978; Henderson 1987; Waldron, 1987; Stojanowski et al., 2002; Bello et al., 2006). In burial where soft tissue is present, decomposition involves more bacteria than in the case of cooked and defleshed bone, which is more vulnerable to fungal attack (Child, 1995; Lee-Thorp & Sealy, 2008). Burial containers are water caches, changing the rate of decomposition. Deep burial may likewise limit the access of scavengers to the bone; bones discarded in a refuse heap or buried in a shallow pit may be gnawed or dispersed (Acsadi & Nemeskeri, 1970; Boddington et al., 1987; Bello, 2006; Buckberry, 2000). Human bone may be subject to additional dangers of crushing or disarticulation from coffin collapse, root infiltration from cemetery topiary, or accidental disturbance when new graves are dug. Artefacts may also affect the rate of decomposition (Boddington et al., 1987; Janaway, 1987). Because of all these factors, caution should be exercised when applying findings from studies of non-interment taphonomy to human burials.

Forensic studies contribute a great deal on the topic of decomposition of soft tissues in different temperatures, climates, soil types, moisture conditions, and scavenging environments (Mant, 1987; Archer, 2004; Mays, 1992, 2004; Morton & Lord, 2006; Carter et al., 2008, 2010; Ururahy-Rodriges et al., 2008; Stokes et al., 2009; Ross & Cunningham, 2011; Ubelaker & Zarenko, 2011). Pertinent work has also been done on the success of bone retrieval and identification after prolonged burial or exposure (Lewis & Rutty, 2003). Forensic remains are often subject to destructive body treatment such as burning or dismembering, followed by disposal in non-standard environments. The intent of formal Protestant or Catholic burial is usually preservation of the body, by contrast. So, while many of the concerns which are applicable to animal processing studies are also applicable to forensic examples, they may have less
applicability to intentional Christian interments (Fazekas & Kosa, 1978; Garland, 1987; Henderson 1987; Waldron, 1987; Stojanowski et al., 2002; Bello et al., 2006).

Fossil studies concern themselves with the relatively unique conditions that lead to fossilization. They contribute much to the understanding of bone chemistry (Von Endt & Ortner, 1984; Sillen, 1989; Willey et al., 1997; Nielsen-Marsh & Hedges, 2000a & b; Stiner et al., 2001; Denys, 2002; Jans et al., 2004; Nielsen-Marsh et al., 2007; Smith et al., 2007; Turner-Walker & Jans, 2008; Fernández-Jalvo et al., 2010). Of note, soil pH, soil type, and site hydrology have been shown to be crucial extrinsic factors influencing bone survival, while bone size and density are among the more important intrinsic factors (Garland, 1987; Willey et al., 1997; Nielsen-Marsh & Hedges, 2000; Stiner et al., 2001; Lee-Thorp & Sealy, 2008; Djuric et al., 2011). Well-preserved bone maintains high collagen levels and low porosity, though the mechanism is unclear (Smith et al., 2007). The conditions expediting the breakdown of soft tissue appear to be the opposite of those degrading bone. However, taphonomy in the flesh stage may be the most influential factor bone preservation (Smith et al., 1997; Lee-Thorp & Sealy, 2008).

Unfortunately, any fossilized bone has been deposited so distantly in the past that the conditions surrounding interment are largely unknown.

Henri Duday took a fairly unique approach to taphonomy which is rarely considered (2006, 2009). In what he calls archaeoanthanatology, or archeologie de terroir (“archaeology of the earth”), he studies the precise positioning of human bone in the burial environment to describe the processes through which the body breaks down and the specific elements move. These observations are particularly interesting because they theoretically allow the observer to understand such factors as which articulated elements decomposed in which order, whether the body decomposed in a void, whether the burial flooded, and the extent to which roots and small animals moved elements. This in turn contributes to studies of diagenesis as it allows the researcher to better estimate currently unknown factors such as the likelihood of fungal infiltration in a water-logged environment, and the difference in density of articulated groups of bone versus isolated elements.

Unfortunately, in most historic excavations, it is almost unheard of to record burials with a level of precision sufficient to observe these processes let alone derive meaning from them (Murphy, present volume). Duday suggests the multi-level precision drawing of the position of specific elements (2006, 2009), when it is rare for historic excavations to include an illustration of all burial features, let alone anatomically correct and precise ones at multiple depths. Furthermore, it is not common for thorough hydrology, soils, or chemical studies to be undertaken at such sites, against which such observations
could be compared (Murphy, present volume). Generally, archaeological metrics for the recording of bodily preservation and articulation are non-scientific (Buikstra & Ubelaker, 1994; Brickley & McKinley, 2004). They describe the surface preservation of bone by qualitative observational data, such as “good”, “fair”, and “poor” or equally subjective scoring systems (i.e. 1 = good and so on). These are rarely comparable between sites. Because of the difficulty of collecting these preservational and positional metrics, aspects of taphonomy, such as the well-known observations that acidic, gravelly, or intermittently saturated and draining soils expedite the breakdown of bone are not really “proven” in an archaeological sense outside of specific, isolated studies. This in turn makes it difficult to make fact-based observations about age or gender-specific preservation (Walker et al., 1988).

Despite this wealth of research, the dynamics leading to advanced bone diagenesis are still understood only generally (Garland, 1987; Smith et al., 2007; Djuric et al., 2011). If environmental factors do act on human remains in a regular way, it would be worthwhile to attempt to understand these rates as best as possible, in order to predict what percentage of a population is likely to be affected by various conditions of the burial environment. It is also progressively common for human burials to be excavated with increased care by specialists, able to recognize and preserve infant remains where they are present (Buckberry, 2000; Mays et al., 2012). In particular, the use of photogrammetry is emerging as a way of creating realistic spatial models of burials relatively quickly: if widely adopted, this would aid in the resolution of the numerous lingering questions about relative preservation of different types of individuals in different burial environments. As such, it is of interest whether either of these factors can truly be implicated over the other in the case of the “missing” infants.

**PREVIOUS STUDIES:**

Only a handful of projects have concentrated on population structure or preservation with a specific focus on infants and children. Manifold’s article in Anthropological Review specifically discusses differential infant preservation, however her brief article is limited largely to Medieval sites (2013). No comprehensive study has been attempted. The seminal texts on foetal and juvenile bioanthropology such as Fazekas and Kosa’s *Forensic Fetal Osteology* (1978), *Developmental Juvenile Osteology* by Scheuer and Black (2000), and *The Osteology of Infants and Children* by Baker et al. (2005), provide explanations of juvenile bone chemistry and its potential for dissolution. All cite the common argument that low density and incomplete mineralization lead to the rapid loss of infant bone in archaeology. Fazekas and Kosa further describe the interaction of the remains with the burial
environment, noting the estimates of the rate of skeletonization and degradation of artefacts (1978). In discussions of the bioarchaeology of children and biases in preservation by age, some excavated cemeteries which contradict the wisdom of poor infant preservation are listed (Perry, 2005; Bello et al., 2006; Lewis & Gowland, 2007). Buckberry (2000), Guy et al. (1997), and Djuric et al. (2011) have expanded on the effects of taphonomy and the preservation of infant bone in the field, with Buckberry investigating extrinsic factors, and the others exploring intrinsic factors. Walker and colleagues were one of the first to use records and osteology to determine whether age or sex contributes more to poor preservation in a population of Native American neophytes (1988). Though not focused on taphonomic explanations, they are cognizant of what they view as a post-mortem loss of the juvenile portion of their sample. Lanphear (1989), Lewis (2002), Lewis and Gowland (2007), and Grauer and McNamara (1995) have also contributed good case studies on infant mortality during periods of industrialization based on skeletal data, with mixed findings regarding preservation.

Archaeologists in the Archives, Sites with Records:

In 1988, Phillip Walker, John R. Johnson, and Patricia M. Lambert examined age and sex structure of two populations to ascertain whether female remains survived less frequently than male, and whether preservation differs by age. The groups used were a partial sampling of the Californian Franciscan Mission La Purisma burial grounds (N=32), which served the Mission’s Native American neophytes from 1813-1849, and Ca-Ven-110, a Late-Middle Period (600-1150 AD) southern California native population (N=46), excavated in 1986. La Purisma Mission, excavated in 1964, kept thorough records of baptism and burial with which the skeletal assemblage could be compared. Walker et al. found that sex ratios between records and burials were comparable, but the age structure was not. While the bulk of the burials listed in the records were comprised of infants and the elderly, most of the skeletons found belonged to younger adults. Ca-Ven-110 also displayed relatively equitable sex ratios and a similarly disproportionate age structure; however, there were no records with which to assess the reliability of these findings. It is not stated whether Ca-Ven-110 was completely sampled, so it is difficult to know whether the assemblage assessed is representative of the buried population.

Poor sampling is a major flaw of this study. Excavating a small portion of the cemetery, around 50 skeletons were identified out of a potential 1,491 based on the records. Only 32, or 2.15%, were removed, of which, only 2 were determined to be below the age of 18 (Walker et al., 1988). It is common for children and infants to be concentrated in certain areas of the cemetery (Buckberry, 2000),
so it is not clear that any portion of the juvenile population was ever present in the area excavated. Additionally, the excavation occurred in 1964. As Buckberry has shown, the excavation of adults was often prioritized over young children in earlier periods of archaeology. Their retrieval rate, as well as osteological aging techniques, have improved in recent decades (ibid.).

While the researchers had relatively complete records by which to compare the burials, Catholic missions may eschew the burial of unbaptised infants (Lewis & Gowland, 2007). The cemetery population therefore cannot necessarily be said to reflect the complete mortality of the community. Although not the focus of their work, a population such as La Purisma would be inadequate for exploring “real” mortality profiles for a number of reasons. The behaviours and participation of an unwillingly controlled population may be inscrutable (Hollingsworth, 1968). Natality and infant mortality may change with alterations in birth control, abortion, or child rearing behaviours. General mortality may be further distorted by revolt, unaccustomed labour conditions, preferential survival of those willing to comply with policies and secure resources, decreased survival overall as resources are appropriated by foreign interests, and foreign diseases (Bagnall & Frier, 1994). These factors make the comparison with the structure of Ca-Ven-110, a pre-contact population which was at least 700 years older (Walker et al., 1988), somewhat spurious. Without records, it cannot automatically be assumed that the age and sex structure of the Ca-Ven-110 population was initially similar to La Purisma, or that the skeletal assemblage at the time of excavation was similar to the original population of Ca-Ven-110.

Lanphear, and Grauer and McNamara also used records to study marginalized communities in nineteenth century almshouses (1989; 1995). Lanphear studied the 1984 partial excavation of the Monroe Poorhouse Cemetery. Two hundred and ninety-six individuals were excavated, for whom two hundred and forty-seven mortality records existed. Of these, 44 were unageable due to poor preservation, and 58, or 23.2% of the remaining individuals, were children under 15 (ibid.). As a percentage of the total population, this figure is low, but not outlandishly so. More than earlier researchers, Lanphear describes the excavation and aging techniques, which is incredibly valuable in informing the reader’s appreciation of the findings. Grauer and McNamara compared Lanphear’s sample to the 37 children from the partial excavation of the Dunning Poorhouse in the 1990s. These figures were compared to the poor house burial records, as well as the local and federal census (1995).

In contrast to Walker et al., neither study found any significant difference between the age structure of the surviving osteological population and the admission records. Grauer and McNamara did find, however that the 1870 Chicago census had severely deficient data on children, indicating that
children from 0-15 were only 1% of the population. Lanphear likewise found that local records provided less complete data than osteological analysis, listing many young children only as “infant”. Despite expectations that poor houses ought to have skewed populations (Higgins, 2003), the mortality distribution is relatively normative in both samples, showing only slight unusual peak in death at the age of 3-4.9 years in Monroe (Table 7).

Table 7: Comparison of the Number of Infants and Children by Age in the Dunning Poorhouse and Monroe County Poorhouse, from Grauer & McNamara

<table>
<thead>
<tr>
<th>Age</th>
<th>Dunning Poorhouse n=37</th>
<th>Monroe County Poorhouse n=58</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>0-11.9 months</td>
<td>13</td>
<td>35.1%</td>
</tr>
<tr>
<td>1-2.9 years</td>
<td>10</td>
<td>27.0%</td>
</tr>
<tr>
<td>3-4.9 years</td>
<td>7</td>
<td>18.9%</td>
</tr>
<tr>
<td>5-9.9 years</td>
<td>4</td>
<td>10.8%</td>
</tr>
<tr>
<td>10-14.9</td>
<td>3</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

The work of Walker et al., Lanphear, and Grauer and McNamara elucidate the importance of selecting a population which is assumed to have a relatively normative mortality profile for this type of study: that is, a population, which enters the period of study with a relatively normal age and sex distribution, and that experiences limited mobility and few catastrophic stresses (Moore et al., 1975; Boddington, 1987; Chamberlain, 2006). For this reason, skewed burial populations such as soldier cemeteries, poor houses, orphanages, schools, hospitals, plague pits, colonized natives, slave, and freedmen cemeteries should be avoided, even where their records are good. Unfortunately, many of the assemblages from such bureaucratic institutions are desirable for their record keeping (Swedlund & Herring, 2003), but as the poorhouse studies have shown, records are not always infallible (Lanphear, 1989; Grauer & McNamara, 1995). These types of cemeteries would also appear to be among the most frequently excavated. This may be because such groups lack vocal living descent or were marginalized within their time period, and the cemeteries more frequently forgotten, only to be accidentally rediscovered (Lanphear, 1989; Higgins, 2003). Also problematic to this type of research is the tendency to forego complete excavation. This often results in the type of ambiguous sampling seen in the Mission La Purisma group (Walker et al., 1988). Despite their somewhat normal distribution, the
sample sizes of children in the poorhouse populations were also quite small. It is desirable to have a complete sample to explore the effects of preservation.

**Infant Mortality in Late & Post-Medieval Archaeology:**

Two important studies of infant mortality in industrializing populations were complete by Lewis, and Lewis and Gowland in the past decade. In 2002, Lewis created morbidity and mortality profiles for 831 sub-adult skeletons from the medieval cemeteries of Raunds Furnells, St. Helen-on-the-Walls, Wharram Percy in Yorkshire, and Christ Church Spitalfields. This study focused on the osteological indicators of population stress, which were substantial, with no significant difference by site.

In 2007, Lewis and Gowland further explored the distribution of the 128 infants from the four sites. At all sites but Spitalfields, a high proportion of neonatal mortality to post-neonatal mortality was observed. Two of the cemeteries, St. Helen and Spitalfields, had serious under-enumeration. This may have been attributable to the frequency of crypt burials at Spitalfields, or the partial sampling done. Although the authors of the Spitalfields report do not state the cause of the under-enumeration of infants, it may have to do with the relative expense of crypt burials. By contrast, infants were well preserved at other cemeteries, indicating that differential mortality or differential preservation was at work. These brief examples illustrate the value of comparisons across sites. Infant enumeration varies: even where mortality is thought to be high and additional causes must be sought.

**Infant Bone & Preservation; Palaeolithic to Present:**

Noting the high discrepancy in supposed infant mortality and low recovery from cemeteries Guy and colleagues focused on the chemical composition of infant bone and theoretical chemical interaction with the burial environment. They compared preservation at 5 disparate and very ancient sites with an initial infant mortality for each predicted by Ledermann’s life tables in order to attempt to quantify exactly how many infants were missing. Their work is very general, yet contains many apt observations. If the population structure from archaeological assemblages were truly representative, they argue, it would have to be conceded that human mortality differed from animal in all periods throughout history, only to be “…replaced, between the sixteenth and eighteenth centuries, by a brief episode of the ‘wild animals’ type, precisely at the moment when parish registers came into use.” (Guy et al., 222, 1997).

Touching upon the problem of assuming “high infant mortality” in historical populations is commendable. However, the premise is still quickly accepted, citing a handful of expedient infant
mortality statistics from 1625-1911 (*ibid.*). There was something of a “wild animals” type spike in infant mortality during this period (Newman, 1906; Wrigley & Schofield, 1989), which is not to say that infant mortality was not “high” during periods leading up to the Industrial Revolution (Lewis, 2002; Lewis & Gowland, 2007). It does illustrate however, that quantifiable variation, even in high mortality groups, existed in the past, and should be included in discussions of historical population structure by diligent researchers.

Guy *et al.* are also critical of the blanket argument that infant burials are commonly treated differently (Buckberry, 2000; Lewis & Gowland, 2007). They note that differential treatment is frequently contended, even in the case of cemeteries where few disturbances could have threatened graves, and where funerary rituals are documented. Though conclusions are scarce, their observations show the extent of the task. Not only must initial mortality be taken into account, but so must a variety of taphonomic factors from burial practices, bone chemistry, soil chemistry, post-mortem disturbances, and the skill of the excavators (Guy *et al.*, 1997; Buckberry, 2000). In many cases, the excavators focus on the bottom of the grave shaft, rather than what is on the surface. The preservation of funerary monuments, arrangement of graves, depth of burials relative to the original ground surface, erosion patterns and soil composition of the cemetery, and the number and size of grave shafts are not even recorded in all instances, when they may supply necessary data (*ibid.*).

**Representing Children at Stara Torina:**

In 2011, Djuric and colleagues studied the preservation of remains from Stara Torina, a 9th-11th century AD medieval cemetery in northern Serbia. Their study focused on the internal factors that affect the breakdown of bone in the burial environment. The population included a minimum number of 951 individuals of whom 543 were adults, 81 were adolescents, and 327 were younger than 14. Focusing on the last group, the researchers subdivided the 136 ageable juveniles into age groups of <3 years (N=49), 4-7 years (N=43), and 8-14 years (N=44). They recorded whether each bone was complete, fragmented, or missing, and measured bone mineral density. Further attempts were made to study the effects on diagenesis of bone shape, mechanical stress, and bone structure in the region of different parts of the same bone (*ibid.*).

Methods for describing bone preservation are inconsistent across the field (Bello, *et al.*, 2006). The authors are to be commended for their innovative and intensive approach to a problem which is rarely studied using quantifiable means, however their results are sometimes unclear (Djuric *et al.*, )
They conclude by stating that the total number of complete long bones is “significantly lower” in the youngest age group (N=153) than in the older two (p 256), and attribute this to small bone size. However, by this measure, the number of complete long bones is also “significantly lower” in the 8-14 group (N = 175) than in the 4-7-year-old group (N=198): in fact, the discrepancy is actually greatest between these two groups. The frequency of complete long bones was highest in the 4-7 age category, while humeri and femora preserved better in the 0-3 category than in both the older groups. Within the youngest age category, humeri also survived better than larger tibiae. If the argument that smaller bones do not preserve as well is to be confirmed, these seemingly contradictory results require qualification.

The frequency of complete cranial bones was not compared by age group.

Despite its supposed poor preservation, the youngest age category contained the largest number of individuals identified, while encompassing a smaller range of ages than either of the two other groups (ibid.). This may still represent a smaller proportion of the total 0-3 year olds buried if high infant mortality and lower juvenile mortality can be postulated. However, without knowing what the actual mortality for each age group is, it is impossible to confirm this. No description is given to quantify any unidentifiable bone; however, 19 individuals were unageable (ibid.). This is crucial in such a study because, with more homogenous morphology and fewer developed landmarks, less erosion is needed to render infant bones unidentifiable than more mature juvenile bones.

Overall, the frequency of complete bones is larger than that of fragmented bones. Fragmented bone is not divided by age category, so it is not clear whether it is distributed across ages or concentrated in one. If a substantial proportion of the population had transitioned from fully present to nearly missing, one might expect that the majority of the remaining bone would be fragmentary. Even if the bulk exists in the 0-3 age category, it is probable that some is present within the other two categories, meaning that in all groups bones were complete more often than not. This may imply several things including rapid and sudden diagenesis where present; good preservation overall with few individuals actually “missing”; different extrinsic conditions acting to make certain bones fragmentary; different intrinsic conditions within the broken bones; or the neglect of unidentifiable bone. Guy et al. note this seeming all or nothing preservation, though they also fail to explain it (1997). It would be interesting to see a full breakdown of bone completeness by age category, as well as a count of the bones missing by age category, in order to assess whether bone size really is the primary indicator of preservation.

According to the authors, their findings on bone mineral density from the best preserved and worst preserved long bones between the ages of 2 and 12 correspond with what is expected: BMD
decreases in the first year of life and then increases throughout childhood. Their numbers, illustrated in Figure 1, paint a more ambiguous picture however; if anything, bone mineral density in the sample seems to peak slightly by the age of 7, and a drop thereafter.

Figure 3: Bone Mineral Density of the Best & Worst Preserved Long Bones, from Djuric et al., 2011, p 258

![Bone Mineral Density Graph](image)

It is not clear whether the “best preserved” examples were pairs from single individuals, or whether they were simply the best from the sample. Because the bones in question presumably have all undergone some taphonomic changes, taking an average of the best and worst densities by age might provide a clearer trend. Calculations of bone mineral density are also problematic for non-adults, as they are influenced by bone shape and the size of the medullary cavity. A true measure of volumetric bone mineral density would better clarify age differences.

This study illustrates the need for more comparative works on preservation in different samples and multivariate analysis of burial conditions such as the current work aims to undertake. The comparison of this assemblage to others from similar cultures and periods might tell whether the preservation patterns seen in the Stara Torina sample are a common trend. Studying the date of different interments relative to their preservation, likewise, could help explain the differences in bone density and
preservation. Although beyond the purview of Djuric et al.’s project, adding the number and size of empty grave shafts, dated grave markers, or funerary records to a similar data set would help establish exactly how many individuals were missing and possibly reveal whether rates of decay are linear.

**Missing, Presumed Buried:**

In 2000 Jo Buckberry undertook research in the relative preservation of children in Anglo-Saxon burials in England, focusing primarily on differential preservation between soil types. It was confirmed that cemeteries in gravels or sandy soils generally exhibited poor preservation with small quantities of infant bone present. To better understand notable exceptions to this trend, Buckberry did a limited tabulation of recovery rates of infants and children from excavations in the 1970s through the 1990s. She found that the recovery of infant remains appeared to increase in recent times, implying that the participation of specialists, the use of more precise techniques, and the prioritizing of infant graves has resulted in higher recognition and retrieval of infants (ibid.).

Like others before her, Buckberry acknowledges the possibility that high infant mortality may not tell the whole story, but generally accepts the premise. Enumerating the known factors that affect the taphonomy and diagenesis of infant bone, Buckberry concludes that intrinsic factors alone cannot be responsible for a uniform rate of bone diagenesis, because some older samples are more well preserved and apparently more complete than younger samples (Guy et al., 1997; Buckberry, 2000). Differential burial practice, especially shallow burial for children is proffered as a cause of accelerated decomposition (Buckberry, 2000). One examination of the grouping of children’s graves found no significant difference in their preservation (Bello et al., 2006). Unfortunately, some differentiation in burial practice, such as segregation or shallow depth, may always appear regardless of the population. Grave depth data is not always well recorded in excavations, though greater effort should be made in this area in the future (Acsadi & Nemeskeri, 1970; Guy et al., 1997). Comparison of cemetery arrangement and burial depth might elucidate the extent of these practices to help assess the impact they might have on preservation. For this reason, an understanding of regional burial traditions is essential. If possible, populations with relatively uniform burial practices should be studied.

**CONCLUSIONS:**

Each of the relevant studies regarding preservation and mortality in excavated populations represents an attempt to address some of the issues posed by the current demographic research, however their small scale prevents them from drawing firm conclusions. More initial studies of population structure are including the young (Lewis, 2002; Perry, 2005; Lewis & Gowland, 2007), and will gain
increased relevance with inter-site comparison. Djuric et al. found promising trends regarding bone size and density on preservation, but their results came from a single population displaying some serious anomalies (1997). Facing the same conundrum, Guy et al. proposed an “all or nothing” model of preservation, suggesting that when a certain unknown threshold is reached, infant bone apparently degrades very quickly, whereas otherwise it may remain intact for long periods (1997). This cannot easily be resolved without researching more groups and extrinsic factors such as cemetery arrangement, burial depth, and date of individual deposition.

The current research on cemetery archaeology suggests that study in these areas is lacking in both the question of infant preservation and of the application of cemetery research to larger problems in general (Baugher & Veit, 2014). On the demographic/taphonomic side, Buckberry’s work upheld beliefs regarding the effects of soil type on individual preservation levels and the care of the excavators in recovery, but also encountered outliers and acknowledged the need for more research in burial practices to explain the discrepancies (2000). The studies of Walker et al., Lanphear, and Grauer and McNamara differed in their aims, using known population structure as a baseline for describing preservation or lack thereof. While the principles were good, sampling size and population choice may be problematic. Obviously, the relationship between the initial number of people buried and their preservation over time remains unclear. Each of these studies contained successful elements which were adopted in this project, and pitfalls, which were avoided wherever possible.

Speaking to the issue of the current suitability of historical cemetery excavations for engaging with biological questions, the results are mixed. Several works have been published on the archaeological study of historic cemeteries in addition to the extensive genealogical, artistic, and historical literature (Baugher & Veit, 2014; Cherryson et al., 2012). However, these have often focused on surface, historical, and textual interpretations, or in some instances summarized the excavation work which has been done. Furthermore, while such archaeological studies exist in the UK, the issues pertinent to cemetery archaeology are less discussed in works from the United States. The presentation of archaeological reports in both the US and the UK, as judged by their inclusion of standard archaeological technique, ranges from excellent to shockingly poor (Murphy, present volume). This is not necessarily the fault of the researchers themselves, who may in many cases be constrained by impossible time and budget expectations.

Though long past due, a bioarchaeology of children is emerging, to which the current research will contribute. Drawing on the disciplines of archaeology, osteology, archival research, demography,
statistics, and taphonomy, there are copious variables to consider. When selecting excavated populations, it is crucial to avoid those biased by cultural factors, sample size, and poor recovery or analytical techniques. Intrinsic factors which may affect taphonomy should be limited by selecting genetically homogenous populations with similar diets, while extrinsic factors should be controlled through the identification of typical burial practices and quantification of the cemetery environment. Records should be chosen carefully, and scrutinized for factors which may make them inaccurate. In analyzing them, choosing appropriate life tables and statistical methods will be key. Taken together, it is hoped that a clearer picture of infant mortality and taphonomy in historical cemeteries may be reached.

It is hoped that a clearer picture of the current state of historic cemetery excavations may also be achieved. While in the CRM world at least, there is a pervasive sense that something is amiss with the treatment of human remains (King, 2005), how does one quantify what this is? Harder still, why does this occur and how does one propose to fix it? What constitutes “good cemetery archaeology” when the work undertaken is necessarily dictated by the existing state of the site and the differing research goals of any project? Although daunting, the standards that make up good archaeology apply to historic cemeteries in theory and must be more widely applied in practice, despite the multicomponent nature of such projects.
Chapter 4: Matters of Life and Death: children in burial archaeology

INTRODUCTION:
In addition to understanding the archaeological background of the project, and the physical and statistical factors that are at play when examining populations through archaeological investigation, it is necessary to consider the place of children in archaeology and a wider cultural framework. Both the way that childhood has been studied by researchers, and the way children’s role in society has been understood at various point throughout history are informative when trying to pinpoint the causes behind social behaviors such as burial. This is also true of infant mortality itself, which may be relatively more common depending on a society’s attitude toward and treatment of its children. Only by contemplating past social beliefs surrounding children and evaluating culture-based researcher bias, can an objective picture of historical childhood and the future study of childhood be achieved. This chapter provides a foundation in these topics.

CHILDREN IN ARCHAEOLOGY:
Before undertaking research of this scale, it is important to ask why it is necessary. For many years, children have been neglected archaeological inquiry (Scott, 1999; Lewis, 2002; Hirschfeld, 2002; Gottlieb, 2000; Kamp, 2001, 2005; Baxter, 2005; Thomas, 2005; Lally & Moore (eds.), 2011). There is a perceived difficulty in identifying children’s specific contributions to material culture so they are often subsumed under the similarly marginalized category of women’s studies (Kamp, 2001 & 2005; Baxter, 2005). Alternately, children may be viewed as lacking agency within a society or being too chaotic and unpredictable to be understood (Sofaer-Derevinski, 2000; Baxter, 2005). With their inability to articulate desires or create lasting material culture, infants are even more inscrutable (Gottlieb, 2000). A final problem is the persistent tendency to look at sub-adults in all time periods through a modern western lens, wherein it is believed that childhood ought to be a time of carefree innocence (Scott, 1999; Baxter, 2005; Sofaer-Derevinski, 2000; Kamp, 2001, 2005). In fact, in archaeological populations, “childhood” may occur on a vastly different schedule and encompass a completely different range of expectations and behaviours (Minge-Kalman, 1978; Sofaer-Derevinski, 2000; Kamp, 2001, 2005; Baxter, 2005). Societies may also hold and project incompatible views on the ideal of childhood, versus the reality (ibid.).

From both a western standpoint and as a biological imperative, “children are the future”. No matter how a group conceptualizes or treats childhood, society and the individuals within it are driven by
the desire to ensure their posterity. Many consider the 1989 publication of “A Child is Born” by Grete Lillehammer to be the beginning of the archaeology of childhood (Baxter, 2005). The oeuvre is still limited, with an estimated 4% of the literature mentioning juveniles (ibid.). In recent decades, several good overviews have been published (see de Mause, 1974; Sofaer-Derevinski, 1997; Scott, 1999; Sofaer-Derevinski (ed.), 2000; Gottlieb, 2000; Heywood, 2001; Hirschfeld, 2002; Baxter (ed.), 2005 a; Lally & Moore (eds.), 2011; Baxter (ed.), 2012). Of these Children & Material Culture (Sofaer-Derevinski (ed.), 2000); “(Re)-Thinking the Little Ancestor” (Lally & Moore, 2011); the two volumes edited by Baxter (2005; 2012); and Archaeology of Infancy and Infant Death (Scott, 1999) are among the most comprehensive and “archaeological”. Scott’s volume remains the most thorough exploration of child burials a decade later. Other works have tended to be eclectic, including topics such as children in history, the social theory of childhood (Fahlander, 2013), the material culture of children (Baxter, 2005; Schwartzman, 2005), bioanthropology and the treatment of child burials (Scott, 1999; Baxter, 2005; Perry, 2005), and demographic topics (Humphrey et al., 2012; Walker et al., 1988; Lanphear, 1989; Grauer & McNamara, 1995). Works in more specialized areas and time periods have been written and much has been published on infanticide (Scott, 1999; Gowland & Chamberlain, 2002; Murphy, unpublished thesis).

So far, philosophizing has been more common, than to begin the arduous process of collecting material data (Fahlander, 2013). Despite their relative scarcity, child burials have received more attention than other aspects of material culture, because they represent one of the few instances where their presence in an assemblage cannot be ignored or explained away (Scott, 1999; Lewis, 2002; Perry, 2005, Lewis & Gowland, 2007). Many research questions in bioanthropology are stymied by a lack of preliminary data-gathering such as this study proposes. Even where cemeteries are carefully excavated, there is simply not a consistent standard by which to judge whether infant mortality or preservation in them is normal.

DEATHWAYS & BURIALWAYS:

“Why do people spend more money…upon a death, Mrs Gamp, than upon a birth?...It’s because the laying out of money with a well-conducted establishment, where the thing is performed upon the very best scale, binds the broken heart, and sheds balm upon the wounded spirit. Hearts want binding, and spirits want balming when people die; not when people are born.”

—Mr. Mould, The Life and Adventures of Martin Chuzzlewit, Charles Dickens

In order to justify the study of cemeteries in this time period, and particularly to defend the idea that infants were certainly not overlooked in burial, it is helpful to discuss general attitudes toward
burial and infant death. A full investigation into either attitudes toward infants, conceptions of death, or burial practices during such a prolonged time period would constitute the subject of many volumes. However, it is hoped that a brief overview in relationship to views toward the corpse will help situate the work in its discussion of infants and their “normative” burial. In particular, it is illustrated hereafter that no matter what the prevailing public sentiment, be it the affected detachment of the Calvinists or the equally demonstrative lamentation of the Victorians, children were full participants in the prevailing burial culture of the day.

Numerous authors have written on burial practices in the post-medieval period (Wilson & Levy, 1938; Harding, 2002; Burnett, 2014; Tarlow (ed.), 2015). Others have focused on views on death especially from Puritan, Victorian, American, English, criminal, or folk perspectives (see Stannard, 1977; Jackson, 1977; Farrell, 1980; Houlbrooke, 1998; Curl, 2001; Richardson, 2001; Tarlow, 2011). There is no single “attitude” toward death, nor behavior surrounding it during the period from the 1600s to the present. Rather, the post-medieval era has witnessed a swelling and ebbing tide of evolutions in burial tradition, both religious and social. Many authors have tried to explain these changes solely through a lens of religion, status, or sentiment (see Gittings, 1984; Tarlow, 2011), yet all appear to have been factors. Such changes were necessarily dictated by coeval shifts in spiritual conceptions of death and the afterlife among different philosophical groups, as well as an episodic social mimicry or rejection of the burial fashions of the elite. Underpinning these changes, is a persistent current of emotion, which helped to shape acceptable practices of the day (Tarlow, 2011).

During the Medieval period in the UK, and much of the early exploratory period of the US, funeral rituals were characterized by Catholic practice. Rather than confining “mourning” to the funeral itself, burial rituals took the form of prolonged intercession for souls presumably in purgatory (Gittings, 1984; Harding, 2002; Tarlow, 2011). For this reason, the deceased had a vested interest in organizing their own obsequies, especially relating to charity and intercessory prayer. The funeral and the physical place of burial were part of a religious nexus in which the living could both aid the dead and gain merit from aiding the dead (Harding, 2002). In the “danse macabre” imagery of the period, death is ubiquitous. Both graphic and sometimes joyous, death is emphasized as a grisly inevitability which must be embraced. This spiritual preparation for death is found in the notion of the ‘art of dying well’ which was a preoccupation of the late medieval period, and is attested by many wills at the time (ibid.).

Gittings has argued that the early modern period was broadly characterized by increasing anxieties about death following the Reformation as revealed by four factors (1984). These are 1) the increased separation of the living and the dead 2) an intellectual stance which emphasizes the difference
rather than the continuum between soul and body 3) increased denial of the decaying body through coffining and preparation practices and 4) mounting desire for worldly remembrance through

Figure 1: Danse Macabre by Hans Holbein the Younger

monumentalization. Following the Reformation, the idea of purgatory eroded and funerals initially became a terminal occurrence. In addition to Catholics and Recusants in areas where Catholicism was forbidden, many Protestant sects came into being, including the Lollards, Adventists, Anabaptists, Baptists, Quakers, Anglicans, Calvinists, Methodists, and Lutherans to name a few. To discuss them all in depth is not feasible. However burial attitudes among these have been generalized by past authors to two major groups whose beliefs characterized Protestantism at the time: The Calvinists (Puritans) and Anglicans. According to the Calvinist doctrines of predestination and election, the deceased was either saved or damned and nothing could be done to help them at the time of death (Stannard, 1977; Tarlow, 2011). Anglicanism, while not embracing predestination in quite the same way as Calvinists, nevertheless struggled with the exact path to “salvation” in the absence of purgatory and Catholic practice (Cunningham, 2005). Funerals thus became a performative last hurrah by loved ones, mitigating the unease of the living over a fear of damnation tempered with a hope that the deceased was among the elect. This resulted in dichotomous ways of dealing with death.

The first was the Puritanical horror of the body and subsequent focus on personal piety and simplicity in burial. Although this view outwardly emphasized a disdain for worldly things and the ‘worthless’ corpse, formal burial was not eschewed (ibid.; Gittings, 1984; Tarlow, 2011). Tarlow has
discussed the complicated theological understanding of the role of the physical body in the resurrection throughout this period (2011). Publicly, some Anglicans expressed the belief that they “should not expect to receive our earthly bodies back in their clumsy, solid, earthly form” (Sherlock, quoted in Tarlow, 2011, p 27). Others held different views. According to Gittings, “No doubt some people, particularly among the uneducated, held extremely literal interpretation of the resurrection, making the correct burial of dead bodies a matter of importance in their eschatological scheme.” (1984, p 60). Though the extreme Calvinists objected to the Anglican “surety of resurrection” for all individuals, and increasingly felt that the body could be resurrected no matter what its state, the ambivalence regarding who was saved and lingering sentiment for the deceased prevented the truly dispassionate disposal of the corpse (Wilson & Levy, 1932; Stannard, 1977; Farrell, 1980). Despite the inability of Christians to intercede, burial was recognized as a need of the grieving (Tarlow, 2011).

Puritan or Calvinist children, rather than being exempt from this stern religious framework, were seen as miniature adults who must be particularly swayed from their natural corruption, rebellion, and stubbornness (Stannard, 1977; Farrell, 1980). Though children were viewed with detachment, detachment characterized Puritan interpersonal relationships in general. In America particularly, expressions of love in mourning were limited, as to express grief too strongly was to reveal a belief that the loved one may not have been among those destined for salvation (Stannard, 1977).

Despite the highly polemical nature of Puritan writings at the time, it is also thought that the more extreme rejection of burial traditions advocated by the Puritans never flourished to the extent once believed (Gittings, 1984). It was a highly superstitious ideology, in which behaviors revealed undercurrents of uncertainty which stood in contrast to professed beliefs and often retained hidden aspects of Catholic ritual (Richardson, 1988). Ostensibly, burial tradition initially moved away from ostentation, length, and Catholic liturgies (Stannard, 1977; Gittings, 1984). In actuality, it has been found that burial expenditures increased during this time (Wilson & Levy, 1932). Monumentalization and prominent placement of burial in some instances also became more pronounced (Tarlow, 2011). By the Great Awakening, even Puritan funeral practices involved “ostentatious” momento mori, gifts, food, and memorials (Farrell, 1980).

The second major deathway of the early Post-medieval period was a gradual reaction to the starkness and finality of Puritan judgement, mingled with an attempt to retain some aspects of tradition. Heraldic funerals for the aristocracy developed during this time, underscoring the continuity of social order to replace some of the religious order which had fallen away (Gittings, 1984; Morley, 1971). These
were performed with considerable ceremony. They were not available to all classes, however some of their aspects were mimicked, often illegally, by the socially mobile-minded (ibid.). In the late sixteen-hundreds, undertaking as a profession began to replace the heralds. The delay in burial necessary to prepare for an elaborate ceremony increasingly necessitated embalming: a state of affairs about which many were still hesitant, as the extent of the separation between body and soul was not clear-cut to all at the time (Gittings, 1984). Others have argued alternately that this was a concern about bodily “privacy” during a time when carnality was taboo and the post-depositional disturbance of burials was a legitimate concern (Tarlow, 1999). Because of these lingering feelings, the practice would not become truly popular until the late eighteen-hundreds when population mobility and war resulted in death far from home, along with an increased focus on the “sanitation” and “science” that embalming seemed to embody (Farrell, 1980). During the sixteen-hundreds the aristocracy reacted to the manipulation of the corpse and the rigidity of burial protocols with the popularization of less ostentatious “night funerals”, which allowed them a more personal interaction with grief (Gittings, 1984).

In the mid-sixteen hundreds, caught between the out-of-reach pomp of the heraldic ceremonies and the hellfire of the Puritan doctrine, the concept of “decency of burial” began to arise as the overarching sentiment of the period (Gittings, 1984). By the mid-seventeen hundreds, this view prevailed, becoming a dear social tenant that even the poorest families would struggle to uphold (ibid.; Wilson & Levy; 1932). Tarlow has argued that the causes behind this trend towards funerary expenditure and more elaborate memorialization were emotionally driven, rather than an attempt to achieve status (1999). Whatever the motivation, traditionally Anglican and Dissenter burial had been less severe than more Puritanical traditions and could even be fairly secular. At first they served to emphasize charity, show a hope of the resurrection in others, and serve as a reminder that all would die (Gittings, 1984). As with Puritan burial, much “non-formal” superstition was retained and persisted through the Victorian era (Richardson, 1988). Increasingly, obsequies transitioned to the focus on loss and the relationship of the bereaved to the individual as rationalist and Enlightenment views became more prominent in the late seventeen-hundreds. Rather than seeing death as a bitter punishment meted out by a judgmental god, god began to be seen as a watch-maker, who set the gears of life in spin (ibid.; Farrell, 1980).

During the Romantic and Victorian eras in the mid-seventeen to mid-eighteen hundreds, what has been called a “domestication” and “sentimentalization” of death tantamount to “wallowing” or “eroticization” was taking place (Jackson, 1977; Farrell, 1980; Gittings, 1984). This movement, known as the “Beautification of Death”, was characterized by ritualized behavior and objects that idealized
death and heaven, as well as prolonging the mourning and memorialization of the dead (Bell, 1990; Curl, 2001). Although it has been described as highly individualistic and rapidly evolving in its personal expression (Tarlow, 1999), conformity to this culture of death appears to have been pervasive. Rather than being introspective, this preoccupation has been said to obliterate the meaning of death with its omnipresence (Gittings, 1984). Following the rise of Unitarianism in America, with its loving yet rational god, the purpose and exact incarnation of the afterlife had become vaguer (Farrell, 1980). Soon, Unitarian rationalist beliefs were partially integrated into two competing ideologies: religious liberalism and Evangelicalism. These took after Romantic ideals which emphasized the emotive relationship between god, humanity, and the environment.

Romantics saw death as either a sentimental return to nature, or the ultimate crisis of human emotion as the newly minted “individual” grappled with his or her mortality (ibid.). The religious framework of Evangelicalism struggled likewise with the maintenance of social order in the face of the homogeneity of industrialization and the self-determination of individualism. As with the earlier heraldic funerals, the machinery of social order would be maintained during a religious shift (Llewellyn, 1996), but now by mandate of the collective free will of individuals rather than the pageantry of the aristocracy. The result was a deathway in which mortality was both embraced and hidden in frippery by society at large.

By the 1850s, uncertainty about salvation was replaced by reassurance that arose from growing confidence in human control of the universe. This was itself a reaction to the innovation and heightened mortality that characterized the industrial revolution (Morley, 1971). Throughout the late 1800s and early 1900s, increasing scientific control of the body in life as well as death was one manifestation of this view. The dichotomy between body-soul changed during the Enlightenment to the more humanistic duo of body-mind (Tarlow, 2011). However, belief in the literal resurrection of the corpse did not disappear among all. As one Mrs Stone said, criticizing those who “declaim on the worthlessness of the body…”, “Yes, this body- waiting, sleeping, changed- this human chrysalis shall waken, and soar on radiant wing…” (quoted in Morley, 1971, p 33). Rather than theorize about the manifestation of reanimation of the body as had been done in previous decades, the Victorians denied and masked decay, although they were certainly increasingly scientifically aware of it. However, the body, so carefully buried, might soon be disturbed by the constant reburials in overused graveyards that were typical of the preceding period (Cox, 1998).
Although this era was increasingly scientific, it was also superstitious, ritualistic, and ideologically eclectic; the most appealing of a variety of views were brought together to form a new cosmology. For example, the development of Spiritualism in the Victorian era overrode belief in judgement further: the dead could now be contacted (Gittings, 1984; Morley, 1971). This was not an abandonment of Christianity, but rather an attempt to prove and observe aspects of higher realms as the natural sciences was concurrently doing with so many subjects. Even as the followers of religious liberalism continued to uphold the place of religion in an increasingly scientific world, they were happy to do away with old notions of hell while keeping the optimistic prospect of heaven (Farrell, 1980). During the Evangelical era leading to the period, young children were seen as individuals who had a hand in their own salvation. They were admonished to “fly to Christ” to ensure their redemption, as “to commit a child to the grave is trying, but to do it without one ray of hope…would overwhelm [their parents] …beyond the power of endurance.” (Farrell, 1980, p 39). As with adults, though fraught with rigid social observances that centered in the agency of the individual, the path to salvation was more achievable than ever before, being neither predestined nor accessible only to those able to afford the intercession of the church. As with adults, death was sentimentalized among children in poetry and children’s tales such as *The Funeral of Cock Robin* (Morley, 1971). Moving into the Victorian era, there was a social preoccupation with youth, especially in death.

With the spiritual focus now on the individual and their deeds, contemplation of death began to center on paradise achieved through a relatively pious life as accessed through a moving conversion experience (Farrell, 1980; Morley, 1971). Although religion was not abandoned, traditional religious treatment of the corpse and monumentalization shifted to favor co-opted classical themes. The iconography of this period transitions from sobering death’s heads, scythes, and hourglass iconography, signifying time running out, to more sentimental themes such as cherub’s heads, the extinguished torch, the broken column, the urn, and the willow (Dethlefsen & Deetz, 1966; Houlbrooke, 1977; Jackson, 1977; Morley, 1971). The latter illustrated the growing belief that the dead were merely parted from the living, soon to be re-joined.

As an expression of communion with nature, the garden cemetery arose in the 1830s even as industrialization was emerging in the US. It grew into the more manicured park cemetery after 1855 (Farrell, 1980). This change came slightly later in England with the Metropolitan Interments Act of 1850, but followed a similar trajectory (Morley, 1971; Gittings, 1984). Such changes revealed at once a sentimental love of the pastoral, but also a belief in bending nature to the will of man. It was also part of
a legacy of sanitation reforms, culminating first in a move from overcrowded churchyard to urban burial
ground to bucolic cemetery. Harding provides an excellent overview of the early development of burial

Figure 2: Death's Head & Hourglass Iconography (top left), Cherub (top right), and Willow (bottom)

places in *The Dead and the Living in Paris and London, 1500-1670* (2002), while Cox in her work *Grave
Concerns: Death & Burial in England 1700-1850* gives an account of the later periods (1998). This was
the beginning of the modern shift which physically distanced the public from the physical horrors of
death.

In this era of peril and possibility, the taboo thus became romanticized, even at the highest levels
of society with Queen Victoria’s mourning over the death of the Prince Consort. Wealth and materiality
were increasingly linked with respectability and salvation (Morley, 1971). During this time, the
undertaker came to the fore of funerary practice, dictating what was respectable and therefore necessary
(*ibid.*; Gittings, 1984). This naturally correlated with price. The realities of bodily decay were denied and
obscured in progressively elaborate and conciliatory funerary traditions, which were increasingly participated in by the growing middle class. Death itself came to be seen in a gentler light. Private grief was channelled into elaborate and expensive public mourning rituals. The “typical” desirable funeral drew on the heraldic funerals of previous decades in its embellishment, rigidity, sense of propriety, and expense (Morley, 1971). Because of mass production and the economic mobility of the worker, such ostentation was achievable by many (Mytum, 1989). However, where the heraldic funerals had once necessitated delay in burial due to planning, the poorer now witnessed a delay in burial in order to raise the necessary funds. Burial clubs and friendly societies sprung up, often acting unethically, with the promise of insurance against the rising cost of death (Morley, 1971).

Eventually, the ideological distance from death accomplished by the Victorians through their sentimentalization of it would be outpaced by an almost complete disregard for the acknowledgement of death in the modern era (Matson, 2012). In the later Victorian era, there was a shift away from eclectic ostentation to simple religiosity. The advent of wars in the late Victorian period, first the Civil War in America, followed by the two World Wars, overwhelmed the public with untimely death (Curl, 2001). The horror of at the scope and brutality of war deaths substantially simplified and homogenized burial rituals as well (Tarlow, 1999).

The Body:

Throughout the early modern period, the body was not disregarded. Though many different burial traditions coexisted, it was clearly important to practitioners that “their” way of death was correctly followed (Tarlow, 2011). Tarlow has argued that in removing the concept of post-mortem intercession, attachment to the corpse actually became more central at this time (2011). In rare instances, such as suicide and hangings by treason, the body could be “punished” after death (Richardson, 1988). The Murder Act has also been described as a bodily punishment, exposing the offender’s corpse to dissection and depriving it of a “decent burial”. At the end of the 17th century, increasingly Puritanical views to poverty meant that those who died in poverty might also be “chastised” for their “sloth” by being subject to dissection (Wilson & Levy, 1932). This culminated in the Anatomy Act of 1832 in England (Richardson, 1988). It is not clear whether it was merely ambivalence about the separation between soul and body during this time, a concern for “bodily privacy” during a time when the things of the flesh were highly taboo, sadness at being able to contribute nothing to the dead individual’s salvation, or social shame which was the greater deterrent to meeting such a fate (Wilson & Levy, 1932; Gittings, 1984;
What is clear is that negative social reactions to these practices strongly emphasizes the general desire to preserve and respect the corpse.

Pauper’s funerals from the early 1700s through the Victorian era were an object of great disgrace, to the extent that many families would willingly go into debt, or buy a living child insurance in a burial club rather than pay for its education, to ensure that the dead received a respectable burial (Wilson & Levy, 1932; Morley, 1971). The prospect of dissection, even if burial followed, was likewise met with horror (Gittings, 1984; Richardson, 1988). Cremation would not gain popularity until the late eighteen-hundreds (Wilson & Levy, 1938; Morley, 1971). Its inception was belabored with discussion of whether it “…renders the resurrection of a body either impossible, or at least much harder to be conceived…” (quoting The Times, March 1884; Wilson & Levy, 1938, p 45).

Richardson, in her work on the criminal corpse at this time has particularly illustrated a liminal period demarcated by superstitious practice during which any corpse was neither alive nor completely dead and might cause harm to the living (1988). In parallel to the folk practice of placing a coin on the eyes of the deceased to prevent their stare from working evil on the living, for example, newborns instead had a penny placed at the navel. Regardless of whether infants in general were so-called “full members” of society, the existence of such practices clearly show their puissance in death.

Finally, even once buried, respect for the dead did not desist: the movement toward suburban cemeteries illustrates a discomfort with not allowing the dead to rest in peace by the continual disturbance of remains experienced in old churchyards and burial grounds (Morley, 1971). Because of these attitudes, there is little reason to think that it was desirable or even acceptable to treat the bodies of infants or children in a careless or disrespectful manner. Indeed, with the exception of stillbirths, child burials were not always cheaper than those of adults (ibid.). Yet people arguably fought to have their children baptized when a declaration of stillbirth might have provided a cheaper burial alternative.

In a Catholic framework, unbaptized babies had once gone to limbo, which was somewhat neutral in character (Murphy, 2011; Tarlow, 2011). Initially, the collapse of Catholicism left unbaptized babies in an intellectual limbo as Protestants tried to resituate their beliefs about what happened to them after death. The increasing time between birth and baptism during this period reflects a gradual relaxation of the attitude that babies required aggressive intercession to avoid oblivion (Houlbrooke, 1998). Feeble newborns were sometimes named “Creature of God” if they were expected to die (Gittings, 1984). This might at first seem to be callous depersonalization, but it can equally be argued as reflecting a confidence that the children fated to die were already within god’s fold. This is further attested by non-canonical but
nevertheless popular views within Catholicism that young children, sometimes called “los angelitos”,
were so pure that they could often go directly to heaven (Heilen & Gray, 2008 b; Stojanowski et al.,
2002). This is illustrated in one epitaph from 1803:

“Four children here within their graves are laid, The
love of life to God they quickly paid.
Although no shining virtues they can boast, They’re
yet received to join the Angelic host.
Their innocence secures a blest retreat,
They are more favour’d than the rich and great.”
(Richardson, 1988, p 16)

Both where Catholic and Protestant views held sway, the ability of midwives to baptize babies
who seemed imminently to die shows that common people were unwilling to abandon their newborn
infants to spiritual uncertainty after death (Gittings, 1984). Although “normative” burial may not have
been the object of such intercessions, it would likely have been one side-effect. Even where children
were stillborn, a 17th century midwives’ oath dictated that they bury children themselves in an isolated
place rather than allow them to be cast carelessly where their remains could be disturbed (Gittings,
1984). In the Penitential of Fininan, an early Christian document, it is stated that unbaptized children
may be expiated through penance, possibly putting burial of the unbaptized into a gray area (Donnelly et
al., 1999). The existence of stillbirths and neonates both in the osteological record, burial roles, and
cemetery pricing schemes argues that even if “cheap disposal” was an option, it was one which may not
have been favored even for infants who never drew breath.

According to Canon Law, such babies were to be buried separately or in unconsecrated portions
of the churchyard (Duday, 2009; Murphy, 2011; Tarlow, 2011). In Protestant Ireland, the concept of
limbo was not acknowledged and the unbaptized babies of Protestant parents are not thought to have
received separate burial (Murphy, 2011). This suggests that just as Protestant communities struggled
with ambiguity in other areas of their worship, they may have had difficulty situating the salvation of
unbaptized children in a variety of new paradigms. It is even possible that such ambiguity found its way
into Catholic communities who were increasingly compelled to share living and burial space with their
Protestant neighbors. Tarlow has insightfully pointed out that even in modern western thought, there is
little congruity between coexisting beliefs that the dead somehow rot, sleep until resurrection, exist as
ghosts, and re-join their loved ones in the afterlife simultaneously (1999, p 47). To this end, we may
chemically preserve our dead to maintain the illusion of vivacity, cremate them, return them to the earth
in an “eco burial”, or even have their remains compressed into a diamond (Matson, 2012). Yet many would say that such diverse practices are consistent with the above beliefs. Understanding one aspect of a professed belief is clearly not a perfect indicator of how people ritualize that belief.

In the early post-medieval period, burial choices were far more standardized than the smorgasbord of today. Though the admonition for midwives against discarding stillbirths in alleyways or in a rubbish heap implies that they should not do it, it may also imply that some would be tempted to (Gittings, 1984; Tarlow, 2011). It has often been argued that stillborn infants were disposed of unceremoniously, or at best that their isolated, scattered graves are unlikely to be found archaeologically (Tarlow, 2011). In several rare instances, isolated infant remains have been found in non-normative contexts, such as an 18\textsuperscript{th} century well (Burnston, 1982). Where infant remains are not expected (i.e. trash contexts) it is easy for them to be misidentified as faunal. This opens the probability that such sites are more numerous than the few that have been identified. While this should not be ruled out as one possible deathway surrounding stillbirths, archaeological evidence makes clear that it was far from the only option. In Catholic Ireland, cillini burial places of the stillborn, unbaptized, and other liminal deaths are fairly well attested (Murphy, 2011; Tarlow, 2011). In other instances, infants have been shown archaeologically to have been buried in consecrated ground near altars or under the eaves of churches where they could be continually “baptized” (Stojanowski \textit{et al}., 2002). Other infants may be found, buried non-normatively in consecrated ground, suggesting illicit burial (Tarlow, 2011).

In some formal graveyards, especially with Quaker and Baptist burials, juveniles seem to be underrepresented suggesting occasional near-complete exclusion (Powers & Miles, 2011; Caffell & Clarke, 2011). However, in general, completely separate infant graveyards in the archaeological records are rarer in America and the UK than in Ireland. In their volume, Cherryson and colleagues noted several instances of outlying burials, perhaps indicating a larger tradition as yet unexplored (Tarlow, 2011; Cherryson \textit{et al}., 2012). As osteological aging techniques and excavations improve, exclusion is proving to be the exception rather than the rule as once thought. There are many emerging archaeological examples in which osteological analysis has shown that neonatal and premature babies were buried in formal ways, even in Catholic contexts (Harding, 2002; Heilen & Gray, 2008 b). Segregated sections of burial grounds are also often detected (Stojanowski \textit{et al}., 2002). It is thus possible that in some of the samples in which infants have been believed to be excluded, they have simply been unexcavated. Neither are the burials of the very young necessarily neglected in terms of consideration and opulence (Heilen & Grey, 2008). Numerous examples exist of infants buried with both expensive material goods, and
touching personal effects such as homemade necklaces or toys (ibid.; Pye, 2012 c, 2010 b; Feit & Trask, 2013).

Together, these observations demonstrate that the body in general was not to be neglected in death, and that infant bodies were historically included in prevailing burial traditions at least some of the time. The belief that infants may have been treated differently than older individuals in death has at its core an assumption that infants and young children were considered somehow “different” or “less” than full members of society. Thus, it is useful to contemplate whether these considerate burial trends may be further substantiated as “typical” by understanding attitudes toward children at the time.

THE SMALLEST COFFINS ARE THE HEAVIEST: Historic Attitudes to Infant Death

It has often been argued that in societies where infant death was common, parents must not have allowed themselves to become attached to children until such an age as they were “out of the woods” so-to-speak (Cunningham, 2005). Purportedly, this manifested in careless burial practices, ranging from forgoing the formal observances traditional with older individuals, to a deathway tantamount to the discarding of infants like trash or dead pets (Aries, 1960; Stone, 1979). In addition to asking whether the archaeological record substantiates such claims, it is useful to consider what range of views people may have actually held towards infants and young children in the post-medieval period. Though sources vary, two obvious views emerge. First, juvenile death was often a source of grief in personal and public ways. Second, early life mortality was seen as a problem in need of remedy.

The volume of literature surrounding attitudes toward children has grown in the last few years. Phillipe Aries remains one of the most influential contributors to the discussion of childhood, with his work *Centuries of Childhood: A Social History of Family Life* (1960). Therein, he argues that childhood as it is conceived today was unknown in the medieval period. Following the belief that life stages were understood and delineated more in terms of activities and achievement than by numeric age, Aries contends that emotional investment in children must have been low in high mortality environments. Increased depictions of children in portraiture and references to a distinct speech and fashion of children during the 1600s are used as evidence of growing sentimentality. He suggests that the emerging culture of didactic childhood was one in which the child was both coddled as an innocent creature, and strictly managed to protect and shape its purity. This was concomitant with a retreat into “private” family life during the 1700s. Other early writers on the history of childhood, such as Lloyd De Mause (1974), Edward Shorter (1976), and Lawrence Stone (1979) took a similarly dim view of “historical” social
conditions for children. Like Aries, in his work *The Family, Sex, and Marriage in England: 1500-1800*, Stone observed a transition from a time when supposedly, infanticide was rampant, children were neglected in squalor, and habitual instructive beatings were the norm (1979). De Mause took a psychosocial approach, viewing children as an often-overburdened nexus for the projection of their parents hopes, disappointments, and fears (1974). Focusing on the masses rather than the elite, Shorter argued for a mid-eighteenth century transition from “indifference” to “sentiment” regarding children: this was even later than the “turning point” favored by his contemporaries (1976).

Aries also tackled the subject of western attitudes toward death in his 1974 and 1982 works. Of note, he suggests that the mourning of the Victorians was insincere; if true, this would imply that any grief displayed towards children could not be interpreted as a genuine expression of attachment or their value. In the same vein, Stone puzzlingly found no evidence of mourning expenditures for young children among English families in the 16th-18th centuries (Stone, 1979; Zelizer, 1994). This is extremely odd, considering the 1938 work of Wilson and Levy, which outlined a history of funeral traditions and funeral costs for all ages with a numerous historical receipts and statistics. Beyond the issue of cost, distinct burial traditions for children, such as the burial of unbaptized children in a special baptism gown known as a chrisom, or the use of white plumes rather than black are well-documented (*ibid.*). Although the focus of Wilson and Levy’s work was the 19th century, it makes ample reference to earlier practice.

While much is owed to early writers on childhood and deathways, Aries and his contemporaries have been criticized by many medievalists and historians for their use of subjective or selective sources (Wilson, 1980; Cunningham, 2005). Sociologists likewise have expressed scepticism of what they perceive as a fundamental misunderstanding of parental attitudes (*ibid.*). In modern studies of family planning decisions, other authors have argued that incidences of juvenile mortality are independent of attitudes toward any given child, and particularly have no bearing on responses to their death (Cannold, 1998). Other historians have taken exception to the idea that historical childhood did not exist, simply arguing that it had culture-specific manifestations (Stannard, 1977; Cunningham, 2005). In addition to this, Aries’ views on death have been critiqued as unquantified, overly simplistic generalizations (Harding, 1998).

There are indeed two problems with the observations of early authors on childhood and child death. First, what constitutes an “adequate” expression of emotion is culturally relative. The idea that children are not properly loved if they are not shielded from everything hurtful and difficult is a modern
western view (Cunningham, 2005). Stannard has argued that the Puritans were great lovers of their children, despite their strict and austere culture (1977). Some sources actually state that compared to French children of the day, English and colonial children were quite detrimentally coddled (ibid). Secondly, it is common for social problems to be overinflated in observations of their polemic, while quotidian behaviors may be hidden if they are so common (or otherwise out of bounds) as to go unmentioned. If one considers the discussion of abortion rights - or in the case of the ancient world, infanticide - in places where some parties strongly oppose it for example, history shows that opponents have been touting the same doomsday remonstrance about moral collapse and population decline for thousands of years (Cannold, 1998; Murphy, 2009). The opinions expressed by such vocal individuals are not invalid per se, but represent only one facet of the cultural position on the topic. By contrast, the Egyptians, who had some of the most extensive and elaborate burial practices in the world left no written record of embalming. Therefore, the propaganda of any historical social movement, such as that surrounding the extent of child abuse or infant health reform, should be approached cautiously. Neither should a failure to document a practice be taken as confirmation that it was not practiced, even widely. Recent authors have argued of the history of death that “…early generalization has been supplemented by more precise inquiry…” but that “…we are not yet able to write a general account of death (or mortality) in the early modern and modern periods.” (Harding, 1998 p 206).

Little has been written focusing specifically on how attitudes toward children shaped their funerary traditions through the early post-modern period, although many works such as those of Stannard (1977), Gittings (1984), Curl (2001), Tarlow (1999, 2011), and Cherryson and colleagues (2012) touch on the topic. Tarlow has argued in keeping with Stone’s analysis of growing romantic love, that familial attachments must have become very strong as the post-medieval period wore on (1999). Murphy has written about modern and historic parental attitudes in reference to the Irish cillini burials (2011). In addition to attitudinal studies of modern maternal loss, she cites biological research in which hormones are altered to foster desirable caring behavior in expectant parents: a biological fact which presumably was true throughout much of history. This genetic imperative is an argument which has received far less attention than it deserves. Any viable child is already a substantial biological investment merely because of the risk to maternal life during pregnancy and birth. Lactational amenorrhea, or prolonged breastfeeding to delay menstruation, is a contraceptive method that has been known since ancient times (Nardi, 1981; Becker et al., 2003). In addition to being an investment, an infant may therefore be a
source of protection for the mother, fostering a mutually beneficial relationship in addition to biological feelings of affection and attachment.

In 1983, Linda Pollock offered the first thorough criticism of Aries, Stone, Shorter, and de Mause. Using accounts of children in historic diaries and biosocial evidence, Pollock found that there was no change in parental grief over the death of a child, and that parental sentiment in general regarding children was not an emotion that emerged in the post-medieval period. She also argued that the practicalities of child rearing were very different from those expressed in treatises and advice publications. This undermines the credibility of many of the more public sources used by her predecessors to reach their conclusions about parental indifference.

Although the ideas of Aries and colleagues linger in discussions of historical childhood, more recent researchers have tended to take different approaches. Zelizer in her work, uses the changing economic value of children to argue from their transition from valuable for primarily for their economic potential to “priceless” for their emotional value (1994). Unlike her predecessors, Zelizer does not contend as strongly that children were not “loved” or were somehow disregarded in early history, rather she documents the change in how they were esteemed. In relation to child death in the late eighteen hundreds, she illustrates the population’s fervor for its children in its outrage at their accidental death, and its willingness to insure children. Prior to this time, she argues that infant death elicits “regret but not sorrow” or that it is viewed as “very hard but … a Tax which we must pay.” (ibid. p 24-25). This is also supposedly evident in the description of infants as “it” or “the little stranger”, and the practice of naming a new baby after a dead sibling (ibid.). These arguments ring slightly hollow. While such expressions are undeniably less effusive than those of the 18th century, it may be a mistake to equate them neatly with attitude. It is more so to assume that one aspect of attitude necessarily equates with practice.

Firstly, the fact that “regret” and “hardness” are expressed at all implies that infant death is not desirable: these expressions are neither dismissive nor positive. Second, the characterization of children as “it” may speak more to conceptions of infants as ungendered rather than unimportant. Few in the modern world have never encountered a small baby in neutral colors and had to make an awkward judgement about which pronoun to use. Neither is an epithet such as “the little stranger” necessarily aloof; in modern parlance “ragamuffin”, “little monsters”, or “cheeky monkey” are typically loving, even though they have seemingly negative connotations. Reuse of names is not necessarily convincing in cultures whose naming conventions are highly repetitive either. For example, in the analysis of 17th century vital records from the American Southwest during the course of this research, the majority of
children within a single family would simultaneously have elements of the names Jesus and Maria, regardless of their gender. Furthermore, reusing child names, themselves often the names of dead relatives from the previous generation, can be construed as evidence of memorialization of dead siblings, or an unrelated need to “keep the name alive”. Finally, it is conceivably not essential that people felt extreme grief in order for them to feel compelled to observe formal patterns for the burial of young children. As discussed in the segment on general funeral traditions and the body, it is possible that a visceral reaction to improper disposal of the body, such as that which paupers and criminals were subject to, or a status-driven need to provide a “decent burial” could shape burial traditions for all ages regardless of feeling about the individual. Fortunately, it is not necessary to take this view: revulsion, propriety, and grief were all present in heavy measure.

In the opening pages of her work, *Bereavement and Commemoration*, Tarlow argues that memorializations of the dead are projections of the love felt for them by the living (1999). By this standard, there is little reason to suspect that infants would be neglected in the early historical period. However, the prevalence of funerary memorialization for all ages varied throughout the period, becoming more common at the latter end as part of a trend establishing permanence of burial plot (*ibid.*). Also, because formal public expression is not the only avenue for expressing grief, grief surrounding infants during this long period appears to have been overlooked by writers such as Aries until the Victorian culture of death resulted in effusiveness.

Writing in 2005, Hugh Cunningham was one of the first to utilize a panoply of historic sources to study childhood in the past. He finds ample evidence of admiration for children and parental grieving at their death. Citing sources from as early as the 1600s, Cunningham illustrates how throughout much of the historic period parents consoled themselves with the idea that their children ultimately “belonged to the lord” but professed “fear”, “exquisite sickness”, “sorrow”, “grief” and a range of other negative emotions when their children became ill or died. Where they can be found, early expressions of familial love for young children, rather than being callous, are often quite touching. In 1658 John Evelyn describes of the death of his five-year-old son from ague:

“….at that tender age a prodigy for wit and understanding; for beauty of body a very angel; for endowment of mind of incredible and rare hopes… I caused his body to be coffined in lead and reposited on the 30th at 8 o’clock that night in the church of Deptford, accompanied with divers of my relations and neighbours, among whom I distributed rings with this motto, *Dominus Abstulit* [the Lord has taken away] intending God, willing, to have him transported with my own body to be interred in our dormitory [vault] in Wooton Church… to lay my bones and to mingle my dust with my fathers.” (Gittings, 1984, p 81)

When his younger child died a few weeks later, he observed:
“The afflicting hand of God being still upon us, it please Him also to take away from us this morning my youngest son, George, now 7 weeks languishing at nurse, breeding teeth, and ending in a dropsy. God’s holy will be done! He was buried in Deptford Church the 17th following.” (ibid. p 82)

Though Gittings has used this to argue for an attitude of lesser attachment to babies, it is not necessarily so. Here, a younger and older child within a family receive similar burial and become the objects of their father’s grief, despite the fact that the toddler had been away “at nurse”.

As Cunningham has described, parents might console themselves with pious devotion, but, “their grief is unmistakable.” (2005, p 50). After the death of his two young daughters in the mid-sixteen hundreds, Martin Luther is quoted as saying “…never had I though a father’s heart could be so broken for his children’s sake” (Cunningham, 2005, p 50). An Essex clergyman named Ralph Josselin described his dead daughter as “…a boxe of sweet ointment, which now its broken smells more deliciously than it did before…” (ibid., p 51). The American reverend, Cotton Mather, living in the late 1600s, lost nine of his fifteen children during a measles epidemic. In contradiction to supposed Puritanical restraint, in the midst of bereavement he “…begged [to be spared from] such a bitter cup, as the death of that lovely child.” referring to his languishing two-year-old daughter, Jerusha (Wells, 2003 p 60). When his adult daughter lost her own newborn in a smallpox epidemic he opined, “To strengthen a dear child in the agonies of death is a sad wo…” (p 63). Indeed, one need look no farther than the Salem Witch Trials over which Mather’s grandfather presided to be certain children were far from invisible, particularly when manifesting signs of illness. In a more scientific vein, Benjamin Franklin later advocated for vaccinations, speaking with regret of losing his son, “…a fine boy of 4 Years old…” to smallpox (Stern, 2003, p 108). Clearly, in private, the death of children was a stinging source of grief, against which families initially bargained with higher powers, and then increasingly took medical and behavioral precautions to avoid.

Crucially, Cunningham has illustrated that high infant mortality was not independent of parental grief, even during the periods when parents were obliged financially to relegate their children to risky wet-nurses, or to neglect as the parents labored in the field or in the factory (2005). It has been argued that these attitudes of regret worsened in the late 1700s as social conditions improved and infant mortality lessened (ibid.; Gittings, 1984). Of the death of his favorite daughter, an Englishman named Arthur Young lamented “My sorrow has softened me and wrings my very heartstrings! How hard does it appear submissively to bow to that text, ‘He that loveth son or daughter more than Me is not worthy of Me.”’ (Gittings, 1984, p 59). The situation was much the same in America. Letters between cousins in New York show one pair of women comforting each other at the death of their two children: Mary, a
“little rosebud”, and a boy over whom grief could not be fully expressed (Marshall, 2003). In 1851, upon the death of his daughter Eva, a New York businessman made an uncharacteristically sentimental entry into his account ledger: “Great God what an affliction. How I worshipped my lovely, intelligent child is known only to Him above… Great God can I ever become reconciled to the loss of my dear angel of a child. God what great sin have I committed that I should be visited by so severe an affliction.” *(ibid., p 186)*. It is particularly telling that this example was in a private ledger, and therefore may be assumed to be an expression of the gentleman’s inner thoughts to some level.

Infant mortality rose again during the population boom and urbanization of the mid-1800s (Morley, 1971). Stone (1979) and Aries (1960) have argued that it was during this period that grief over infants reached a fever pitch. More recent authors would add that it was not because grief was not present prior to this period, but rather that regret was made all the more profound by the emerging “unfairness” of infant death following a period where it was more likely to be prevented (Zelizer, 1994; Cunningham, 2005). Although there is copious documented evidence of bereavement as Stone and Aries observe (1979, 1960), this may also be a reflection of the more visible funerary culture and preoccupation with death at the time (Gittings, 1984). Grief itself may have been more manifest solely in personal accounts and letters during the previous century, as evidenced above. In addition to grief being highly visible in Victorian literature, public memorialization, special coffin hardware, portrait statues, and epitaphs became ubiquitous (Zelizer, 1994).

There was also a great social preoccupation with preserving infant life. Social reforms for children were numerous in the mid to late 1800s as the population at large concerned itself with their youngest members through medical reforms, social outreach, and public programs (Meckel, 1990). These included widespread milk banks, maternal education, and a drastic increase in the valuation of child life insurance (Zelizer, 1994; Meckel, 1990). This is not a mere sudden acknowledgement of previously invisible children (Cunningham, 2005), rather infant social reforms were part of a larger preoccupation with public and health and medicine that had been fomenting for over a hundred years (Meckel, 1990). Because the scientific factors behind infant mortality and sanitation in general were only beginning to be understood, the populace advocated for improvements as they became available; for example, Benjamin Franklin encouraging vaccination in the late 1700s. In fact, as the below health advertisement illustrates (Figure 3), rather than babies being treated *differently* than older members of society, public health reformers had to establish the unique needs of infants in the minds of the public; what was best for an adult, no matter how well intentioned it may have been, was not best for baby.
Public and private expressions of grief persisted throughout this period. William Ellery Channing wrote in 1822 of “…the void in a parent’s heart when a child is taken.” (Farrell, 1980, p 28), yet speaks collectively of his three dead children “…gone from us, but not lost to us”. This reflects the changing view of god’s hand in death, but does not diminish the grief expressed. Public grief over children is likewise attested during this time. A Victorian era memorial card for a baby reads

“A lovely flower soon snatched away
To bloom in realms divine
Thousands will wish at judgement day
Their lives were as short as mine”
(Gittings, 1984, p 17)

The poem, The lambs safely folded, in the Victorian text, Why Weepest Thou? A Book for Mourners similarly tells the tale of a mother tearfully consigning her “sweet lambs” to the Shepherd’s fold. In this maudlin work, the dual views of acceptance and performative grief are expressed as the mother “weeping bitter tears” and “clasp[ing]… [her children] to [her] bosom”, nobly bids her “lambs” to go (Morley, 1971, p 15). Although such sentimental themes may at first seem dismissive, the attitude expresses the “participation” of the cherished infant in the Victorian culture of death. Though juvenile death may have still been a quotidian occurrence, so was mourning over them. Even in rural settings infants were part of the grieving culture. An 1808 inscriptions recorded during the Orkney Graveyard Project reads:
“Born Scarce to bud
Grim Death’s relentless hand
Which neither age nor youth
Nor strength withstands
Snatched the dear babes
From this vain world’s abode
To live in Heaven
Eternally with God”
(Tarlow, 1999, p 74)

Epitaphs were rare in Orkney during the period (ibid.), so the fact that “babes” were among some of the few commemorated illustrates that grief felt for children was one part of the normative deathway.

CONCLUSIONS:

The evidence for attachment to children, arguing against dismissive or non-normative burial practices, is manifold. First attitudes to the body in general throughout the period placed a high level of importance on the preservation of the corpse (Richardson, 1988). Although Puritans professed to be dismissive of the flesh, their funeral practices contradicted them (Stannard, 1977). Other sects were even less verbally dismissive, and more ritually elaborate (Gittings, 1984). Second, attitudes toward the importance of a decent burial are virtually indisputable during the time, resulting in a series of burial reforms, outrage against dissections, and social actions such as the investment in burial clubs (ibid.). Third child and infant burial is specifically attested in historical accounts of funerary practice. Specific traditions, superstitions, material culture, and fees are attested in written record from such burials (Wilson & Levy, 1938). Fourth, even where infant and stillbirth burial was thought to be suspect because of ambiguous beliefs toward infant salvation or emotional attachment to infants, even young and stillborn infants are present in the archaeological record more often than not (Heilen & Grey, 2008; Murphy, present volume). With the exception of Quakers and Baptists, even Catholic burials often show normative or special placement of infants who could not possibly have been live born. Conceptual loopholes like home baptism and los angelitos are known, providing a get-out-of-jail-free card that stands in contrast to the canon beliefs of the day.

Finally, despite arguments that historical people were not attached to young children, written accounts and practices throughout the period show that the death of children was a source of consternation and outright grief (Zelizer, 1994; Cunningham, 2005). Expressions of grief may have taken different forms, and been acceptable only in certain contexts during different periods. However, the overall picture of infant death at the time is one of increased control; both in terms of prevention and
respectful treatment of the dead at burial (Meckel, 1990). While alternate beliefs and burial traditions necessarily existed, the prevailing beliefs and behaviors of the time imply that infants and children were not generally neglected or excluded from burial.
Chapter 5: Meet Me at the Cemetery Gates: historic cemeteries in an archaeological context

INTRODUCTION:

In attempting to study infant mortality and taphonomy in historic cemeteries, it is apparent that numerous issues specific to historic cemeteries and their study must first be addressed. All of the previously mentioned factors, including the social causes behind historical behaviors, the physical factors affecting burial, and the demographic techniques which make the study of infant mortality in the past possible, are points of data collection which should ideally be considered in all historic cemetery projects. These unique sites have a long history of use which often bleeds indistinguishably into the modern era (Cherryson et al., 2012; Baugher & Veit, 2014). For this reason, their study may be colored by a sense that they lie somewhere between archaeology and current affairs. This in turn may result in the diminished level of data collection that this research has expanded to critique. The frequency of public archaeology projects rather than academic investigations surrounding historic cemeteries, may compound these issues, particularly in the United States (Merriman, 2004). The following chapter provides necessary background on the use and study of these complex sites, particularly as the private practice of Cultural Resource Management (CRM) has emerged as a central force for the archaeological mitigation of such sites in the United States.

HISTORIC CEMETERY STUDIES:

“Thus the archaeologist insists upon working up the skeletal material which he has exhumed; the ethnologist prefers to correlate his own anthropometric data with his cultural findings, and the physical anthropologist raids in all directions and utilizes miscellaneous booty.” (Hooton, 1935, quoted in Buikstra, 2006, p25)

Introduction:

Although not the original focus of this work, it became necessary to take stock of the research which has been conducted on historic cemeteries to date. Historic cemetery relocation has been going on in the United States and the United Kingdom since before such cemeteries were even considered “historic”. Owing to space constraints, during the early post-medieval period it was not uncommon for church plots to be sold for a short period rather than in perpetuity (Cherryson et al., 2012; Baugher & Veit, 2014). Disinterment after a period of five or ten years was typical, followed by secondary interment in charnel houses or mass burial pits (Figure 1) (Jenner, 2005). Graves often included multiple stacked interments, with some accounts stating that 15 or more people might share a grave (Cherryson et al.,
The re-digging of graves for additional interments disturbed those buried below and the shallow depth of the topmost burial often meant that remains would rise up during the rain. As a result, churchyards and burial grounds became noxious places (Mytum, 1989). This is especially so when one considers that disease was believed to be spread in part by miasma, or bad odors at the time.

Figure 1: Catacombs, Paris (Author)

The unsanitary conditions that resulted from the overcrowding of cemeteries occasioned a series of cemetery reforms which have been discussed extensively by authors such as Wilson and Levy (1938), Mytum (1989), Cox (1998), Cherryson and colleagues (2012), and Baugher and Veit most recently (2014). Briefly, these can be summarized as an interdiction against intramural burial, closure of overcrowded churchyards, a transition to urban burial grounds, a closing of the urban burial grounds, a transition to the garden cemetery, and finally a transition to the lawn cemetery as we know it today (Figure 2) (ibid.). In the US, where space was at less of a premium, family burials grounds were common alongside local church cemeteries (Baugher & Veit, 2014). The legislations giving rise to these changes happened on slightly different time frames in the US and UK, but followed relatively similar trajectories. Legislation also arose regarding such factors as depth of burial and number of interments within a single grave (ibid., Cherryson et al., 2012). Overall, these trended towards privacy and permanence in burial.

Even in cemeteries which had not been intended to have a short tenure, construction in developing cities, especially in America, often necessitated the relocation of newly closed cemeteries
during the historical era. In such cases, relatives were implored via the newspaper to arrange for the disinterment of their buried loved ones (Heilen & Gray, 2010 b). Judging by the observed occurrence of disinterment in the archaeological record, it would seem that they sometimes complied (ibid.; Kurota, 2012, 2013). In other cases, the increasing mobility of families and legislative transition away from churchyard and urban burial grounds resulted in independent disinterment of recent ancestors to be reburied where their descendants resettled (Tarlow, 2011). On a larger scale, some substantial clearances such as St. Pancras were occurring by the 1850s (Boyle, 2015). Despite the apparent acceptability of such secondary burials, they typically appear to have resulted in only small percentages of cemeteries being removed in the historic period in the US and UK. Other locales, such as Paris saw more wide-scale removal.

**Historic Cemeteries: An archaeological perspective**

Historic cemeteries are a relatively new field of archaeological inquiry. Spurred in part by genealogical hobbyists, the content and symbolism of gravestones and burial monuments has been a subject of interest to historians since antiquity. Modern studies in the area were particularly inspired by Dethlefsen and Deetz’s 1966 study of gravestone iconography in colonial cemeteries. Following this, numerous popular and scientific works emerged on the artistry and interpretation of historic monuments and notable historic cemeteries (Myer, 1992; Llewellyn, 1996; Mytum & Evans, 2002; Keister, 2004; Mytum, 2006; Brown, 2008; University of Leicester, 2012). An innumerable quantity of publications

First published in 1995, Strangstad’s A Graveyard Preservation Primer is one of the earlier academic works on the material culture of grave markers, dealing mostly with the surface preservation of historic cemeteries and monuments (2013). Mytum followed in 2000 with Recording and Analysing Graveyards. This offers a step-by-step guide to recording a cemetery surface, including coding sheets and a brief discussion of demography. While this is an excellent instruction manual, it deals largely with the cemetery surface, and focuses on burial places with well-preserved surfaces. It also is written with British graveyards in mind, so may not translate perfectly to other cultures.

On the interpretive front, Tarlow’s Bereavement and Commemoration discusses attitudes toward death and loss based on a study of Orkney memorial inscriptions. Though the work is one of the few extensive cemetery research projects undertaken by an archaeologist, rather than a historian or hobbyist, Tarlow is conscious of the “…mood-killing qualities of data-dense academic writing” (1999, p18). Though heavily grounded in data, the work therefore has a more emotive than statistical focus, arguing that the changes in burial tradition and memorialization during the time owe as much to the individual grieving experiences of the bereft as to religious or social attitudes. The experience and motives of the bereaved are indeed, part of the meat of archaeological research into deathways; “meaning” whether in a storytelling sense as Bahn advocates, or as the culmination of analysis as Binford prefers, ought to be the goal of archaeological data collecting (1972). The data itself are the “bones”.

Unfortunately, as Tarlow and others have noted, subsurface archaeology of historic cemeteries, or the process of “gathering the bones” so-to-speak, is still quite limited (2011). This is true both in terms of literal osteological research, and holistic projects that try to tie surface exploration, artefact data, osteological analyses, history, and meaning together. Many archaeological works have focused artefact data; particularly burial furniture (Bell, 1990; Pye, 2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013; Mahoney-Swales et al., 2011; Davidson, 2012). However, only recently has a catalogue and analysis of coffin hardware been widely published (Springate, 2014). Similarly, many site-specific excavation reports exist focusing on a smattering of the possible data, yet it is rare for these to be synthesized, especially in an osteological sense (Murphy, present volume). Arguably, this is the result of the recent
emergence of human osteology or physical anthropology as a necessary discipline (Ubelaker, 2006; Buikstra, 2006 a, b, c, d, & e), alongside a failure to address the unique issues posed by historic cemetery excavations in terms of their scale. Guidelines are beginning to emerge on the sampling of large cemeteries, including those published by the APABE (Mays et al, 2015) and Historic England’s seminars on “Post-Medieval Cemeteries: Best Practice in Excavation and Research” (2016). However, the level to which these will be implemented in coming years remains to be seen.

**Physical Anthropology: A brief history**

The first of these issues has to do with the trajectory of human osteology or physical anthropology as a still-emerging discipline. Physical anthropology arose at the turn of the 20th century with pioneers such as Hrdlička, Kidder, Hooton, Todd, and Bass (Andersen Beck, 2006; Ubelaker, 2006; Collins Cook, 2006). Early work focused on acquiring museum collections and raw data. This was not necessarily born out of a lack of curiosity, but rather as a realization that comparative data for “normal” individuals were needed in order to answer the questions about abnormalities that researchers had previously been trying to study (Ubelaker, 2006). Rather than trying to understand past lifeways, early research questions centered on racial inequality, disease, and criminal behavior.

In the 1950s, along with Processualism, a discussion of “New Physical Anthropology” began (Washburn, 1951, 1953; Buikstra, 2006 a, b, c, & d). As early as the 1970s, bioarchaeology was solidifying as an area of archaeological discourse under researchers such as Clark (1972) and Buikstra (1977). Like Processual archaeology, the discipline has used scientific study of biological materials to accomplish “anthropological problem solving rather than descriptive data collection.” (ibid. p xviii). However, the development of the discipline has usually tended toward the perfecting of scientific technique and gathering comparative data. It has been noted that bioarchaeology and archaeology have historically developed along very different trajectories, and continue to be in need of unification (Buikstra, 2006 b).

During the historical period, methodological improvements first took the form of seeking the input of medical practitioners in osteological excavation (Buikstra, 2006 b & c). It was soon realized that collecting selective information such as skulls alone was failing to advance the profession, and so samples were expanded and the data points broadened. Early physical anthropologists such as Hooton increasingly recognized the necessity of preserving archaeological context, as well as addressing larger questions (Anderson Beck, 2006). Initially, the standardization of measurements was resisted by some of the old guard, reluctant to believe that techniques they had developed required any revision or
unification. The opposition was to the point where proponents of standardization were reluctant to produce formal proposals of unified methodology (Milner & Jacobi, 2006). However, the quiet adoption of standardized practices by a majority of younger physical anthropologists eventually won out. Standardization has increased in recent decades to include a range of methods for recording and analysing geomorphometrics, age, sex, pathology, preservation, paleodemography, metric, and nonmetric data, driven by a growing number of research questions (Buikstra, 2006 c & d). This history culminated into the formation of a coherent methodology, discussed at length in the technical volume by Martin and colleagues (2014).

To attempt to define all questions which can be explored with Bioarchaeology would be much akin to trying to state all of the questions which can be answered by the study of Biology itself. Larsen’s volume *Bioarchaeology: Interpreting Behavior from the Human Skeleton* is one of the earlier books surveying the many possibilities in the emerging field (1999). It discusses the utility of some of the research questions which can be addressed from skeletal samples including demographic, growth, pathological, genetic, and dietary studies. Rather than being case driven, its focus is the development of a theoretical framework for future studies based on some of the broader data points that the human skeleton yields. This was followed by Buikstra and Beck’s *Bioarchaeology: The Contextual Analysis of Human Remains*, providing a discussion of the history, development, social context, and future directions of the discipline (2006). Other formative volumes include *The Body as Material Culture: A Theoretical Osteoarchaeology* (Sofaer, 2006), *Social Archaeology of Funerary Remains* (Knusel & Gowland (eds.), 2009), and *Social Bioarchaeology* (Agarwal & Glencross (eds.)., 2011). These cover a wide range of topics with a view towards the use of interdisciplinary studies and the importance of using bioarchaeological data to answer social questions.

Stojanowski has published one of the few large bioarchaeological studies to tackle questions of demography and geospatial development at specific multiple post-medieval burial sites of mission cemeteries in Spanish Florida (2013). Unlike other volumes which have been lackadaisical in their sampling, and restricted in their analyses, this is a very thorough statistical study which reveals the possibilities arising from careful selection of culturally, temporally, and geographically linked archaeological cemetery populations. It is limited in that the geographical and temporal focus are narrow, as are the number of specific sites, when considering the possible lexicon of cemeteries of the same period. However, this is necessary for the level of mathematical analysis undertaken. It is through such analysis that a factual picture of mission life during the time can be approached.
God’s Acre: A unique archaeological landscape

It is also only in the past five years that thorough works have emerged specifically on the archaeological treatment of historic cemeteries in the United States and the United Kingdom (Cox ed.), 1998; Cherryson et al., 2012; Baugher & Veit, 2014; Mays et al., 2015; Historic England, 2016). These excellent works have created inventories of many of the historic cemetery excavations that have taken place, and summarized the genesis of cemeteries in the post-medieval period, as well as the ideological and legal framework that has surrounded the development of the professional practice of historic cemetery excavation. Despite the success of these publications, the topic remains vast, encompassing an elaborate series of legal situations, conflict between academic and private practice, archaeological logistical issues, complicated research questions to be addressed, and varying reactions from descendant communities.

The Archaeology of American Cemeteries and Gravemarkers, while admirable for being first to tackle the topic in the US, devotes only two scant chapters to so-called “below ground archaeology” (Baugher & Veit, 2015). The work gives a brief history of cemetery archaeology in the US, focusing in a dilatory way on NAGPRA, ethics, and a handful of case studies involving some of the better reports on work that has been done in the field. It does not go into depth on any of these topics, nor into unique methodological concerns, legislation, what is contributed either to historical archaeology or other fields through the study of historical cemeteries, or the practical aspects of who excavates historical cemeteries and why. In their summary of past work, the authors agree with Blakey that relatively fewer ethnic European cemeteries are excavated. However, they then go on to talk about European descent cemeteries in greater length, giving more examples.

The greater part of the book is devoted to the past study of gravestone iconography (ibid.). While clearly an integral component of historic cemetery archaeology, historic gravestones have traditionally been treated more as an art historical or textual source through which to study topics such as emotional attachment (e.g. Tarlow, 1999), stylistic developments (e.g. Dethlefsen & Deetz, 1966; Keister, 2004), cultural change (e.g. Mytum & Evans, 2002), and religious ideology than as a means of answering biological questions about the population. Several works exist on demography derived from classical monuments (i.e. Schiedel, 2001; Laes, 2007). Except for the demographic sections of Tarlow’s work on Orknian memorials (1999) and the University of Leicester’s work on the extent of how closely the memorialized population represents the buried population (2012), little complex demographic work has been done on historical monuments outside the context of excavation reports.
While fruitful sources of demographic information, the classical study of funerary monuments has revealed numerous difficulties with tombstones as primary sources (Bagnall & Frier, 1994; Chamberlain, 2006). First, not everyone receives memorialization; this is dictated by the actions and desires of the survivors as well as prevailing social convention (Schiedel, 2001; Laes, 2007; University of Leicester Graveyard Group, 2012). This results in the disproportionate representation of certain genders and age groups, while simultaneously influencing the tone of the memorial. Even when memorialized, factors such as age may be intentionally altered to positively shape the impression of the viewer (Llewellyn, 1996). Within a burial place, not all tombstones contain all “relevant” data points; names, dates, family information, and cause of death may variously be included or omitted. Where data initially existed, it may be destroyed by time (Mytum, 2000). Many cemeteries did not necessarily utilize lasting memorials; in the American west, simple wooden crosses were often used (Heilen & Gray, 2010a). In African American burial grounds, bespoke “trash” items representing folk traditions were often used in place of formal headstones (Blakey, 2009 a & b). In Puritan burial grounds, monuments might be intentionally destroyed as a warning against ostentation (Gittings, 1984). Clearly, tombstones alone do not yield a complete or accurate demographic picture of a cemetery, to say nothing of other archaeological topics such as expressions of religious beliefs. There is still a great deal to be learned from tombstones, however their aesthetic appeal seems to continue to deprioritize the study of other archaeological topics within cemeteries.

The volume written by Cherryson and colleagues is considerably more archaeological, summarizing various principles pertinent to historic cemetery research in the UK in an organized format (2012). Covering topics ranging from religious and cultural attitudes, site usage, funerary practices in material culture, and burial furniture, this work is a more thorough attempt to quantify all previous work conducted in the UK. Because the nature of archaeological work in historic cemeteries is itself more standardized in the UK than in the US, perhaps it is unsurprising that the authors have been able to come to a clearer picture of overall burial practices and the process of cemetery excavations. This may also be a result of the mass immigration into the US and migration therein, resulting in an eclectic series of lifeways and deathways. Both the works of Cherryson and colleagues, and of Baugher and Veit are acutely cognizant of the fact that historic cemeteries are likely to be encountered during construction, to be larger than anticipated, to be excavated by private cultural resource management, and to be unevenly published in grey literature (2012; 2014).

To a lesser extent, case studies of specific cemeteries or specific archaeological issues within cemeteries have been written. King and Sayer’s volume deals with a number of social and archaeological
topics, including two excavation summaries for burial grounds (2011). While offering good insights and reviews, one cannot help but wish full accessible volumes had been dedicated to the excavation and analysis of the Bow Baptists and General Baptists of Priory Year Norwich (Powers & Miles, 2011; Caffell & Clarke, 2011). Other case studies, such as Ellis’s “A Disciplined Childhood” arising from her doctoral dissertation of the same name (2014), and Werner and Novak’s “Archaeologies of Disease and Public Order in Nineteenth-Century New York” (2010), focus on aspects of bioarchaeology at Spring Street Presbyterian Church in New York City, without the existence of a full published archaeological report of work at the site. Many individual sites are published in this manner, with only papers on the more “interesting” aspects of the site resulting from excavation, especially where CRM firms are concerned.

In addition to a summary of the evolution of burial practices and burial law in England, *Grave Concerns: Death and Burial in England 1700-1850* is a similar volume which is mostly comprised of case studies (Cox, 1998). Some of these are regional. Others are overviews of individual sites, while others focus on a discrete problem, such as an understanding of specific pathologies or material culture. When discussing “the way forward”, the editor opines that “Of all the areas covered in this volume this is the one that is perhaps least satisfactory, simply because there are so many concerns and research priorities that it is not possible to do justice to more than a few” (*ibid.* p 203). In particular, they state that the ethical concerns of historic burial are a subject which has barely been explored. Harding’s chapter touches on the importance of demographic and quantitative research, noting that not all analyses favour this approach over storytelling (1998). Jez Reeve speaks of the practical aspects of large cemetery excavation and the numerous difficulties and benefits inherent (1998). He lists five major headings of research issues in post-medieval burial archaeology including funeral archaeology; osteoarchaeology; burial environments, preservation, taphonomy and diagenesis; archaeological methodology, and evidence for known historical events. Beneath these are twenty-four sub-headings, some of which are specific to British studies, and others which are applicable to all historic cemetery excavations. Both Reeve and Harding emphasize prior research as a necessary step preceding excavation (1998).

The volume edited by Tarlow, contains a number of case studies in the UK, Estonia, Latvia, Sweden, France and Germany (2015). These vary in their focus from specific burial traditions to Boyle’s case study on eight post-medieval burial ground excavations in the UK. In her article, Boyle discusses some of the unique challenges posed during a number of Oxford Archaeology excavations of post-medieval burials. Among these, Boyle speaks of the general disregard for historic period elements, and the heavy constraints on time and analysis allowed. She raises many crucial issues, such as the difficulty
of sampling strategies without defined research agendas, the problems with “low-resolution” analysis of remains in situ, and whether the expectation that the developer pay the costs of excavation and analysis is always a reasonable one. The standard recording, analysis, and publication of results in keeping with acceptable archaeological practice is described as “unusual” in such scenarios. Ultimately, the author expresses regret that more osteological assemblages are not recorded in full. Along with Emery, Boyle argues that three-dimensional recording is crucial for meaningful analysis (2015). These issues are probably felt by anyone who has worked in contract archaeology in both the US or UK, though they are rarely voiced in formal publication.

**Historic Cemetery Excavation: Laws, ethics, and guidelines**

The legal requirements surrounding the treatment of human remains in much of the world have recently been summarized (Marquez-Grant & Fibiger (eds.), 2011). However, in addition to providing only short overviews of several pages per country, none of these works address the issues unique to historic cemeteries in depth. Ethical concerns when dealing with human remains have also been approached by Sayer (2012). While not focusing on historic cemeteries per se, Sayer includes many examples of historic excavations, primarily concentrating on public reaction to burial relocation and display in the United Kingdom. Legal requirements for excavation are considerably more uneven in the US than in the UK and the majority of the discussion of the relocation of human remains in the US has been couched in the development of NAGPRA legislation led by tribal groups (Mihesuah (ed.), 2000; Fine-Dare (ed.), 2002; Charee & Lavallee (eds.), 2013). In the UK, the legislation has been more driven by a firmly established archaeological profession trying to clarify their rights and responsibilities in the face of changing public law (Marquez-Grant & Fibiger (eds.), 2011). In both the US and the UK, the remainder of the discussion has taken the form of adverse reactions by special interest group to individual cases, and the collaboration of archaeologists (or failure to collaborate) with such interest groups to achieve a favourable outcome (Sayer, 2012).

Formal archaeological excavations of historic cemeteries have been occurring in the United States and the United Kingdom for several decades. One of the earliest such excavation in the US was at Jamestown in 1897, however it was almost another century before such excavations became common (Baugher & Veit, 2014). Though public archaeology arose in the US via governmentally implemented programs such as the New Deal (Jameson, 2004; Milner & Jacobi, 2006), private Cultural Resource Management (CRM) firms, which are responsible for most excavations today, truly became a professional institution in the 1970s (King, 2005). The legal and professional development of public
archaeology and CRM has been discussed colloquially by King (2005), and more technically in Merriman’s volume (2004). From a bioarchaeological perspective it is considered that historic cemetery excavation in the US truly came into being after the 1982 National Register clarified the relationship of historic cemeteries to CRM (Rose et al., 1996). Technically, the general procedures for the treatment and analysis of human remains apply to professional practice in historic cemetery projects (Buikstra & Ubelaker, 1994; Brickley & McKinley, 2004; English Heritage, 2004, 2005). These have focused more heavily on techniques for analysis than excavation, though it is held that general archaeological principles of excavation and recording apply. Sprague has also suggested uniform terminology for recording burials themselves, though not focusing on the historical period (2005). Duday has added very high standards of visual recording for burial positions, however these are virtually ignored in most excavation scenarios (2006, 2009). There is currently no comprehensive volume dedicated to the excavation of historic remains (Mays et al., 2015), but existing guidelines are more specific than in the UK than the US (English Heritage 2004, 2005).

In the US, the law states that an archaeologist meeting the Register of Professional Archaeology standards be responsible for designated archaeological projects (Ubelaker, 2011; RPA 2016). However, state law typically dictates whether archaeological recording is necessary, especially dependent upon land ownership (Merriman (ed.), 2004; King, 2005). The enactment of the law is left to discretion of the professionals. Jameson provides one of the most thorough summaries of the rise of public archaeology in America and its relationship to government initiatives, as well as federal and state law (2004). Few academic discussions of the state of archaeological practice in relation to historic burials exist. The National Register Bulletin has issued Guidelines for Evaluating and Registering Cemeteries and Burial Places (Potter & Boland, 1992). As with similar English guidelines, this is brief at 33 pages. It focuses fairly narrowly on graveyards with excellent surface preservation and monuments. Though forgotten burials sites or those with no remaining surface structure, such as the African Burying Ground in New York, may be registered on the list of Historic Places, this is somewhat less common unless they are accidentally disturbed during construction (Ubelaker, 2011). The broader state of affairs regarding the state of historic cemetery excavation policy in the US is neglected. A rare exception is Garman’s critique of the application of law pertaining to such excavations in the US states of Massachusetts and Rhode Island (1996). In addition to be severely limited in its geographic purview, this commentary was issued a decade ago and has not been followed in the intervening years by similar works.

In 2005, an Advisory Panel on Archaeological Christian Burials in England (APACBE) was formed to provide advice to professionals in the field. The result was a publication “Guidance for Best
Practice Treatment of Human Remains Excavated from Christian Burial Grounds in England.” (English Heritage, 2005). This contains many useful flowcharts of the steps involved from the planning process to publication. It emphasizes the value of historic remains and upholds the use of standard archaeological methodology in their excavation such as maintaining careful stratigraphy and taking depth measurements. This is an excellent overview. However, it does not go into depth about many specific problems that may be encountered.

In 2009, this panel was reformulated to include all archaeological Burials (APABE, 2013). They have recently unveiled a guideline for “Sampling Large Burial Grounds” (Mays et al., 2015). Although brief at 17 pages, this provides helpful insights into sampling strategies as well as discussing assessments of historical “significance” in regard to legislation set out in “Conservation Principles” (English Heritage, 2008). The authors draw the conclusion that the starting position should be that, “…where threatened by a development, excavation and post-exca
vation study of all burials which contribute to the significance of the burial ground is normally the correct response, even when numbers are very large.” (Mays et al., 2015, p 4). While acknowledging the difficulties posed by financial and time constraints, the panel argues in no uncertain terms for the thorough and complete analysis of large osteological datasets.

This seems to be reactionary to the sort of difficulties described by Boyle in her case study (2015): although archaeological methodology is prescribed by law, it would appear that it is often neglected because of financial and time issues which tend to downgrade historic burials as “unimportant” (King, 2005). Archaeologists themselves may be caught up in this ambivalent state of affairs; it is only with the complicity of the “Professional Archaeologist” that such work goes forward. Jez Reeve has commented that “Just because it may possible to record/measure/photograph something does not mean that it should be done. It may only be reasonable to address one or two key issues on a burial site because of the levels of documentary evidence and survival of archaeological material.” (Reeve, 1998, p 221). King also speaks of the dichotomy between research agendas and the impossibility of collecting all data that will be important to different researchers. Advocating the use of the “crudest tool” necessary to do that job, he jokes about naming his bulldozers “Trowel” and “Brush” in response to the shock of his colleagues at their use during the clearance of two large cemeteries (2005). While the survivability of archaeological materials is clearly a factor, as what is no longer extant cannot possibly be recorded, the time involved in obtaining high “levels of documentary evidence” should have less bearing on whether work is done from an ethical perspective. Just as in the “hard sciences”, it is neither ethical nor productive to eyeball measurements which should be precise, use an axe to do the job of a scalpel, nor
eschew control groups because they are expensive or time-consuming. In fact, it is worth questioning whether archaeological work should be done at all if it cannot be done to industry standards.

In both the US and the UK, “shortcuts” which would rarely be acceptable in a traditional archaeological excavation, are fairly common where historic burials are concerned (Boyle, 2015). These include digging through the upper layers of burial features with heavy machinery and failure to fully document the features using illustration and photography (King, 2005; Murphy, present volume). The omission of such basic steps or the lack of clear research agendas is rarely emphasized in reporting (King, 2005). Often, the bulldozers waiting ominously in the wings are seen as less sinister because the previous generation of archaeologists remembers an era when the bulldozers were even more impatient (ibid.). The admonition of policy makers to conduct sufficient research in order to anticipate sampling and significance prior to excavation in order to minimize such practices is an admirable one (Mays et al., 2015). However as with all archaeological excavation, a site which has copious textual evidence of a rich history may prove to be largely obliterated upon excavation, while one with no known records may prove to be rich in material or osteological data. It is difficult enough for archaeologists to fully anticipate the extent of a project at its outset without time constraints driven by development agendas and accidental discovery. However, with the rare exception of generously funded projects such as Spitalfields (Molleson et al., 1999; Boyle, 2015), Alameda Stone (Heilen and Gray, 2010a-e), and the African Burial Ground, this is the common state of affairs.

Indeed, a comprehensive summary and comparison of excavated historic cemetery reports is non-existent in both the US and UK. Cherryson and colleagues have published a gazetteer of excavated cemeteries in the UK (2012). Simon Mays also maintains an informal database (Mays, personal communication). In Reeve’s chapter in Grave Concerns, an index of known London burial grounds and cemeteries is included (1998). While this represents a tremendous effort, there are numerous problems accessing and utilizing such sources. A review of Cherryson’s gazetteer reveals that of the 297 listed post-medieval burial excavations in England, Scotland, and Wales, 30% (N=88) have an unknown number of burials. A further 11% have only a vague number, such as “a minimum of nine” or “20+”. Of the remaining reports, 29% have a sample size of less than ten, with almost half of these including only a single excavated burial. The remaining ninety sites (30%) are not necessarily suitable for all types of studies, if any. The inclusion of a total number of burials does not equate to analysis; the extent and quality of each excavation is not thoroughly clarified in the gazetteer, nor are the contents of each report discernible. A quick spot-test of the sources for sites with sufficient sample size and known number of burials reveals that such excavations are not even necessarily published. Rather, the excavation may exist
only as a figure or summary referenced in another archaeological report. Many are BIAB supplements or similar. Others are merely summarized in an article (see Webb & Norton, 2010; Powers & Miles, 2011; Caffell & Clark, 2011). This is not meant as a critique of the gazetteer, but as an illustration of the difficulty of acquiring excavated cemetery reports, and their variable quality.

The benefits of more formal regulations surrounding historic cemetery removal in the UK is reflected in reports, especially including those published by the Museum of London Archaeological Service in the last fifteen years. These include Royal London Hospital, St Pancras, Spitalfields, New Bunhill Fields, City Bunhill Burial Ground, St. Marylebone, three burial grounds in Tower Hamlets, Crossbones Burial Ground, St. Benet Sherehod, Chelsea Old Church, and St. Mary and St Michael (see Brickley et al., 1999; Thomas, 2004; Miles & White, 2008; Cowie et al., 2008; Connell & Miles, 2009; Henderson et al.; 2013; Fowler & Powers, 2014; Miles et al. 2008a, 2008b, 2015). In addition to their formal publications, MOLAS also maintains a searchable database from osteological collections from historic cemeteries currently undergoing analysis (http://archive.museumoflondon.org.uk/Centre-forHuman-Bioarchaeology/). Rather than mere summary and interpretation, these volumes and databases include data which can be used by future researchers. A few outlying volumes such as that on St. Martin in the Bullring (Innes-Smith et al., 1999), and Spitalfields via the Council for British Archaeology (Molleson et al., 1999) have also resulted in formal publications. Some contracting firms such as Oxford Archaeology also generally produce reliable reports which can be accessed on their website (http://oxfordarchaeology.com/research/ourpublications).

In the US, despite frequent relocation of historic cemeteries, the publications of high quality are disparate in origin, date of publication, and geographic locale. Among the most notable for their size and thoroughness are the Alameda Stone Excavation, Tucson (Heilen & Grey, 2010 a-d); The Voegtly Cemetery, Pittsburgh (Ubelaker & Jones, 2003); the African Burying Ground, New York (Cheek & Roberts, 2009 a-d); The Dallas Freedman’s Cemetery, Dallas (Davidson, 1996); and the Avondale Burial Place, Macon (Matternes et al, 2012 a, b). Notably, three of these are minority cemeteries, reflecting the dark history of slavery in the United States. Such reports have several things in common. First, they give a traditional archaeological account of the excavation itself, including project background, obstacles, and methods employed. Second they engage with historical and documentary sources in order to discuss the context of the cemetery. Third, they perform informed archaeological analysis of the findings including the human remains. Fourth, they utilize the archaeologically and historically derived data to address research questions or tell the story of the site from an archaeological perspective. Finally, they are
published in formally disseminated print format, or are available online, allowing them to be useful to future researchers.

Conclusions:

Until recently the archaeology of historic cemeteries has been limited largely to the study the surfaces and tombstones of well-kept and well known cemeteries. Such projects have yielded and continue to produce informative results on iconography, emotion, commemoration, and belief (Dethlefsen & Deetz, 1966; Tarlow, 1999; Mytum, 2000). Historic cemeteries have many more promising avenues to be explored such as more thorough estimates of demography, familial relations, and causes of death. The extensive world of below-ground cemetery archaeology remains largely untapped (Cherryson et al 2012.; Baugher & Veit, 2014). Uneven legal standards and pressures when cemeteries have been recorded has resulted in sporadic publication (King, 2005; Boyle, 2015). Additionally, few researchers have yet taken an interest in the subsurface archaeology of historic cemeteries. As interest and the implementation of their excavation develops, historic cemeteries offer a unique chance to understand not only the recent past, but larger archaeological questions as well.

PUBLIC ARCHAEOLOGY:

When one considers the abhorrence of disturbing the dead that resulted in the genesis of the lawn cemeteries of today, is unusual that of all the types of archaeological sites, ancestral burial grounds are among the most likely to involve bulldozers heavily, and that their publication quality is so variable (King, 2005). Studying the history of public archaeology in the US and UK, it becomes clear that two factors have been instrumental in bringing about increased archaeological activity. These are public involvement and the involvement of the government in archaeological policy-making (Merriman, 2004b, c; Luby & Nelson, 2008; Sayer, 2012). Jameson has shown how large-scale governmental programs began the normalization of archaeology in the United States (2004). Although some of these were poorly executed by today’s standards owing to the limited technologies of the day, they employed rather high standards for their day, such as direction by prestigious scientific institutions like the Smithsonian (ibid.). Likewise, archaeology has been historically protected in the UK by an evolving series of legislations (Mays et al., 2015).

Increased legislation requiring archaeology has become a double-edged sword, however. More archaeological projects are now required prior to construction, but in meeting these needs, private contracting firms have risen to become the major stakeholder in archaeological practice (King, 2005).

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These are now responsible for 80-90% of the archaeology in the United States by one estimate, and a substantial portion of archaeological work in the UK as well (T. Wheaton, quoted in Smardz Frost, 2004, p 79; Cherryson et al., 2012). While academic and governmental managed institutions such as the National Trust, national museums, the US National Park Service tend to produce high standards of work, it is in the privatisation of archaeology that archaeological goals seem to be most compromised, forcing the use of the “crudest tool necessary” to get the job done (King, 2005; Boyle, 2015). Indeed, though the most common type of archaeology, very little of substance has been published on private cultural resource management practice (ibid.; Merriman, 2004 a).

Archaeologists are one part of the problem. Like many esoteric pursuits, archaeology moves from the top down, with academic and federal voices usually dictating best practice. Because of this, there may be substantial resistance among those at the top, to the argument that the majority of archaeological practice is in fact substandard. Many such archaeologists may fail to see an issue because their practices are largely in keeping with their ethics and they are not pressured to compromise them on a daily basis. Others may feel shielded from legitimate outside concerns by the ivory tower of science; the voices of the CRM practitioner and descendant groups alike are lost among those yelping that aliens built the pyramids (Smardz Frost, 2004; King, 2005). This is unfortunate because those at the top, without the same level of corporate pressure on their research, are in the best position to speak freely about professional failings. Archaeologists are not innocent of the lapses of the profession at large just because they themselves try to act ethically. Prior to the implementation of NAGRPA two decades ago, Walter Echo-Hawk said, of the eminent institutions at the pinnacle of archaeological practice, “There are many Trails of Tears and one of those trails leads directly to the doors of the Smithsonian Institution.” (quoted in Trope, 2013, p 25)

Although not responsible for the direction of archaeology in a professional sense, the public may ironically be the ones most in control of it. In Merriman’s volume on public archaeology, the discourse on the engagement and education of the public in archaeology has hinted at several key issues that archaeologists must address (Acherson, 2004; Copeland, 2004; Merriman, 2004 a, b; Smardz Frost, 2004). These are 1) Creating a sense of stewardship in the public so that they themselves do not contribute to the destruction of archaeological sites 2) Educating the public about the findings which archaeologists believe to be true, so that they do not believe unsupported fringe theories 3) Educating the public about what archaeologists do, so that they do not oppose or hinder archaeological research on methodological grounds and 4) Fostering a sense of interest among the public; making archaeology meet their needs whether they be for education, entertainment, identity, political clout and so on, so that they
become advocates for archaeologists in our goals to secure time and resources for projects. The last and arguably most necessary of these, making archaeology meet the needs of the public, has been resisted by archaeologists in recent generations (Smardz Frost, 2004). Many factors may be responsible for this, including a feeling among archaeologists that they are scientists, not tour guides, performers, or teachers (Copeland, 2004). A second, and perhaps more major factor is the history of archaeology which has witnessed its discoveries being co-opted for nationalist agendas, or hijacked by unsupported theories: for example, trying to force modern religious themes onto ancient discoveries.

Merriman hits rather accidentally on an interesting loophole in archaeological belief relating to the co-opting of interpretations, namely, “Alternative views are not to be particularly encouraged, except in the case of indigenous belief systems, which occupy a separate category…” (2004 a, p 6). Why should it be that “indigenous” groups are allowed to drive policy with whatever they happen to believe to be true? What’s more, what is an indigenous group (Parker Pearson & Ramilisonina, 2004)? Why aren’t Catholicism, Ozark folk superstition, or syncretistic Afro-American slave Vudu indigenous belief systems, worthy of special consideration (Heilen & Gray, 2010c; Burnett, 2014)? Merriman’s statement speaks to a crucial answer; we suspend our disbelief as archaeologists and respect “indigenous belief systems” largely because we have been forced to by the law as a consequence of our own insensitivity (Luby & Nelson, 2008).

In the United States, although NAGPRA initially halted the rampant archaeological excavation that had been proliferating at Native sites for generations, it actually forced an unprecedented increase in scientific analysis as museums were compelled to study the collections they had been accumulating for decades (Mihesuah (ed.), 2000; Fine-Dare, 2002; Jameson, 2004; Charée & Lavallee, 2013). Many archaeologists continue to oppose NAGPRA and what they perceive as the interference of minority groups in important scientific research (Liebmann, 2008). Despite some legitimate qualms with the implementation of NAGPRA, the legislation has been a mirror for archaeologists’ own hypocrisy. They have failed to adequately study collections already in their possession; a fact which extends to many types of museum holdings (Merriman, 2004 a; Jameson, 2004). Furthermore, archaeologists have taken what was never theirs to impose their study on in the first place, and offered back their conclusions as fair compensation for the theft (Charée & Lavellee, 2013 b). In medicine, this would be much akin to experimenting on an individual without their consent, and then justifying the action by saying it was for the common good.

Though many argue against NAGPRA on the grounds that compromising scientific rigor in consideration of non-scientific viewpoints is unacceptable (Clark, 1998), this compromise, whether in
the form of eschewing research agendas or using precise tools, can ironically be seen in the implementation of many CRM projects (King, 2005). In CRM, the compromise is made for money: an undesirable state of affairs which is frequently glossed over (ibid.). Rather than opposing it at the source however, like a schoolyard bully who is himself bullied by a teacher, many of archaeologists’ frustrations may be misdirected at the lay community, who seem to complicate matters further by attempting to reclaim objects, sites, and interpretations which are in the weakening clutches of archaeologists (Clark, 1998). These archaeologists have failed to recognize a valuable ally in the public. Of a project involving Klallam cultural patrimony King noted that “Millions of dollars [were] being spent trying to balance the needs of the project with respect for the dead, and for Klallam culture. Not with respect for archaeological data…” (King, 2005, p 55). Yet the additional investment may create the space for archaeologists to conduct work within their ethical framework; a tribal monitor may require smudging of burials and traditional containers for human remains, but they most likely would not stand for bulldozers roughly exposing graves.

Special interest groups, both minorities with historical grievances, and majorities with a large unified voice, have great potential to be sympathetic and powerful. This is being seen increasingly with the greater respect paid to African American and Afro-British cemetery excavations (Jameson, 2004; Sayer, 2012). While this has been a result of public outcry, the true teeth lie in legislation that demands considerate archaeological treatment of the dead (Trope, 2013; Mays et al. 2015). As stated in the introduction, archaeology is most valuable for its human interest; bridges do not fall and people do not die if our science is not practiced (Bahn, 1984; McGovern, 1995). Therefore, in order to be allowed to continue practicing our science the story archaeologists tell must out of necessity meet the needs of a large group of listeners in some way. Without this interest, there is no outcry, and without outcry, there is no change.

As the dust from NAGPRA settles, many archaeological projects are allowed to continue with minimal restriction when permission is granted by the tribes and collaboration is increasingly embraced (Luby & Nelson, 2008): the current author has been involved in six over the past few years. A similar state of affairs could only improve other types of burial excavations and burials on non-Federal projects, which are currently carried out ahead of the angry bulldozers. Archaeologists must seek out the needs of special interest groups, be they Catholics, or rural West Virginians, or descendants of Vouduns, and attempt to find needs that we can meet without compromising our science. We must recognize that with these groups lies the power to veto some of our projects, but also to veto some of the inconsiderate treatment that construction interests have long required.
PART ONE

Chapter 6: Fifty Shades of Gray Literature; Deconstructing ‘high’ infant mortality with new data sets in historic cemetery populations.

INTRODUCTION:

The first three papers within this volume seek to explore the initial questions of the study. These are: Is infant mortality uniformly high in excavated archaeological populations? Is the appearance of infant mortality in excavated populations heavily dependant on taphonomy, or is it possible that an excavated population is fairly representative of the buried population? These questions are not only interesting for our understanding of life in the historic period, demographic patterns, or for the inclusion of infants in archaeological discourse. They are illustrative of the exciting possibility of using osteological datasets taken from historic populations to answer questions in older archaeological populations.

Answers to such questions are obscured in ancient populations by too wide a variety of factors arising from the many “unknowns” of ancient history: where variables like base population size and normative burial tradition are only guessed at, it is not possible to draw firm conclusions about mortality and burial preservation. By looking at populations where factors like burial practices and demography of the buried are understood, the question of whether infants are lost disproportionately in burial environments can be chipped away at, as a first step in reducing the number of variables that continue to cloud the issue.

This trio of papers first asks what infant mortality is like across archaeological populations, and whether either mortality or preservation appears to vary by region in discrete time periods. This basic question clarifies whether what is known about historical infant mortality from historical demographic studies corresponds with the mortality observed in archaeological populations; it shows whether mortality is a range or a discrete figure, and whether such mortalities are plausible given what is known about the historic period. The second paper compares burial records to excavated cemeteries in order to quantify the extent of taphonomic loss from burial to retrieval at specific sites. This establishes whether such losses are similar between sites, showing whether the mortalities observed from excavated
cemeteries may be true as well as plausible. Further, it sets a standard against which to compare older sites in order to see if taphonomic loss increases progressively through time. The final paper in the triad compares recent populations to older populations, using the knowledge derived from the first two papers to explore whether these findings may be applied to older archaeological populations.
Fifty Shades of Gray Literature; Deconstructing ‘high’ infant mortality with new data sets in historic cemetery populations.

AMANDA MURPHY

This paper was presented at the American Association of Physical Anthropology Conference, 2015. A version of this paper is being published in a monograph entitled Beyond the Bones: Engaging with disparate datasets. Elsevier. In Press

ABSTRACT:

It is a common assumption in physical anthropology that infant mortality must have been much higher in historic human populations than it is today; perhaps reaching 30-50% or more of total mortality. This hypothesis has not been tested, largely because of the lack of reliable demographic data before the Industrial Revolution. By turning to data sources which have never been compared before, it is possible to shed light on this complex problem as well as the most fundamental facets of historic lifeways. Over two hundred cemetery excavation reports from North America and the UK were appraised, of which seventy-three had suitable sample sizes (>10) and demographic data to study ratios of adults (>18 years), children (2-18 years), and infants (<2 years). Nineteen North American cemeteries and all twenty-three British cemeteries employed sufficiently precise age estimation methods to research age-specific mortality in depth and to assess its similarity to standard attritional mortality as compared to Model West life tables. On average, infant and child mortality was lower in English cemeteries (16% each) than in North American cemeteries (25% each). No relationship between mortality and climate could be found. There was a weak correlation between robust sample size and higher infant/child mortality, however a range of plausible mortalities existed within most smaller cemeteries. This suggests that population growth and thorough excavation will partially account for some higher early life mortality patterns, while infant mortality from an excavated assemblage in general may range from ~15-35%.

INTRODUCTION:

Human mortality is a cornerstone in any study describing the lived experience of past populations. It is frequently assumed that mortality—particularly infant mortality—was much higher in ancient cultures than it is today (Caldwell, 1996; Caldwell and Caldwell, 2003; Chamberlain, 2006; Guy et al., 1997; Lewis and Gowland, 2007; Sainz de la Maza Kaufman, 1997). Unfortunately, prior to the advent of organized record keeping, it is difficult to describe past mortality with confidence (Harding, 1998). Osteological samples from historic cemeteries are one underutilized source that is uniquely suited to analyze whether mortality derived from osteological evidence may be a reliable proxy of the true mortality for the population being studied for two reasons. Firstly, historic cemeteries often have
associated burial records, against which osteological estimates of mortality can be compared (Swedlund and Herring, 2003). Secondly, the burial practices utilized are generally understood: namely to preserve the mortal remains of the community “for eternity” (Cherryson et al., 2012). Theoretically, this results in the creation of a representative population sample, which is also comparatively well preserved.

Although it might seem that the juxtaposition of historical records with excavated cemetery reports would be a well-trodden avenue of inquiry, few studies have attempted to engage with both (Grauer and McNamara, 1995; Lanphear, 1989; Saunders et al., 1995). Though a very common type of record, they are unusual in that they are often overlooked and rarely perceived as complementary. Historic cemetery reports seem homogenous, but are diverse in their presentation, retention, and study (Boyle, 2015). Archival records may be lost to memory, inaccessible, incomplete, or untranslated (Grenham, 2006; Jolly, 2013; Wilkes, 2013). Both have much to offer one another. Among other things, cemetery reports are an excellent source of information on infant mortality. And archival records contain a bonanza of demographic information (Swedlund and Herring, 2003). Together, they are filled with potential for answering numerous questions about past health and lifeways.

Infant mortality, or the proportion of infants who perish in the first year of life per thousand born, is central to the study of any culture. (Acsadi and Nemeskeri, 1970; Chamberlain, 2006; Lewis and Gowland, 2007). It is one of the best predictors of the overall health of any population (Meckel, 1990). In modern times, it ranges from as little as 0.02% in developed countries to as much as 50% in areas of the developing world (Barbieri, 2001; Department of the Interior, 2012; Kuehn, 2008; Matthews and MacDorman, 2007). Because the current range of existing infant mortalities is quite wide, to say that past infant mortality was “higher than at present” tells us very little without further qualification.

This pattern of wide mortality ranges persists in the numerous studies prior to 1900 CE (Fogel, 1986, 2004; McKeown, 1976; Newman, 1906; Ruttiman and Loesch, 2012; Wrigley and Schofield, 1989). These describe the effects of nutrition, hygiene, vaccination, and urbanization on the mortality
decline leading up to the modern era. They also have recorded infant mortality percentages from the
teens to the mid-twenties in rural England with highs of ~40% in urban areas (Lewis and Gowland, 2007;
Newman, 1906; Wrigley and Schofield, 1989). In contrast, estimates as low as 2-3% have been proposed
for Colonial America, rising into the teens by the 1900s (Brosco, 1999; Mays, 2004). Variation has been
perceived between countries and between localities within a given country, yielding regional ranges from
below 10% to over 50% (Newman, 1906; Rüttiman and Loesch, 2011).

Prior to 1500 CE, a lack of records causes mortality estimates to become increasingly unreliable,
leading archaeologists to look to alternate sources to approximate them. Medically primitive
communities are one possible proxy; for example, infant mortality from 12-21% is recorded among the
Amish and 20% among the !Kung (Acheson, 1994; Howell, 1979). Studies of ancient demography have
also attempted to understand mortality in prehistoric or classical populations using ages derived either
from burials or what incomplete textual sources were available (Acsadi and Nemeskeri, 1970; Bagnall
and Frier, 1994; Hassan, 1981; McKechnie, 1999; Russell, 1958; Scheidel, 2001). The ambiguous nature
of ancient data and misgivings about sampling has increasingly led researchers to recognize the value of
comparing archaeological and textual sources (Lewis, 2002; Lewis and Gowland, 2007; Perry, 2007;
Photos-Jones et al., 2008; Swedlund and Herring, 2003). Rare studies have compared mortality from
individual historical cemetery samples to burial records (Grauer and McNamara, 1995; Lanphear, 1989;
Saunders et al., 1995). These have found agreement between the two mortality estimates, suggesting that
cemetery mortality may be an adequate proxy for burial records among juveniles. However, this is only
descriptive of specific sites. In order to state more generally whether this is true, many more historic
cemetery samples must be compared.

In a survey of infant mortality in excavated medieval cemeteries, Buckberry (2000) was able to
demonstrate figures around 30%. While not as low as most modern infant mortality, this is not as high
as the estimates of ~35-40% and above which have been postulated by archaeologists and historical
demographers (Caldwell, 1996; Coale and Demeny, 1983; Hollingsworth, 1968; Lewis and Gowland, 2007). This study attempts a similar survey of excavated historical cemeteries which employ sufficiently narrow age-at-death categories to consider the differences between infant, child, and adult mortality from the UK and the US with the goal of determining: a) what is the range of infant mortalities in excavated historic cemeteries, b) how this range compares to known historic estimates of infant mortality, and c) whether the appearance of infant mortality is strongly influenced by factors such as climatic region, urbanization, sample size, and population size/density.

MATERIALS AND METHODS:

Seventy-three reports of excavated historic cemeteries from the US and the UK with sample sizes of ten or more were studied for their inclusion of relevant demographic data derived from osteological sources. The use of small samples was unavoidable, given the scarcity of larger excavated cemeteries. To mitigate this, samples were aggregated in several ways to improve their representativeness. In addition to the availability of reports, sample size, and a minimum quality of osteological analysis sufficient to yield precise ages at death (see Buikstra and Ubelaker, 1994), two other factors guided sample selection. Because of potential noise from racial and socio-economic differences (i.e., disruption to family groups during missionization, forced relocation, or slavery) only cemetery samples with large percentages of European ancestry were selected (Chamberlain, 2006). Additionally, only demographically inclusive samples were used (Chamberlain, 2006). This removes distortion caused by differential age-specific mortality patterns such as would be expected within cemeteries associated with age and gender-selective establishments (e.g., military institutions, poor houses, and hospitals).
Table 1: US Cemeteries Used in This Study, Cemeteries with precise (numeric) age categories marked with an X.

<table>
<thead>
<tr>
<th>CEMETERY</th>
<th>STATE</th>
<th>N=</th>
<th>Age-Specific</th>
<th>CEMETERY</th>
<th>STATE</th>
<th>N=</th>
<th>Age-Specific</th>
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</thead>
<tbody>
<tr>
<td>Big Neal Cove Cemetery</td>
<td>AL</td>
<td>68</td>
<td></td>
<td>Filhiol Mound</td>
<td>LA</td>
<td>16</td>
<td></td>
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<tr>
<td>Becky Wright Cemetery</td>
<td>AR</td>
<td>10</td>
<td></td>
<td>Lane Memorial Hospital</td>
<td>LA</td>
<td>13</td>
<td></td>
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<tr>
<td>Eddy Cemetery</td>
<td>AR</td>
<td>16</td>
<td></td>
<td>7 Rivers Cemetery</td>
<td>NM</td>
<td>45</td>
<td>X</td>
</tr>
<tr>
<td>Alameda Stone Cemetery</td>
<td>AZ</td>
<td>1166</td>
<td>X</td>
<td>Kearny Rd Cemetery</td>
<td>NM</td>
<td>21</td>
<td>X</td>
</tr>
<tr>
<td>LA Cemetery</td>
<td>CA</td>
<td>31</td>
<td></td>
<td>St. Regis Cemetery</td>
<td>MO</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>Woodville Cemetery</td>
<td>DE</td>
<td>10</td>
<td></td>
<td>Collings &amp; Watkins Cemetery</td>
<td>OR</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Roughton Browne Cemetery</td>
<td>GA</td>
<td>14</td>
<td></td>
<td>Voegtly Cemetery</td>
<td>PA</td>
<td>555</td>
<td>X</td>
</tr>
<tr>
<td>Shockley Cemetery</td>
<td>GA</td>
<td>18</td>
<td></td>
<td>Shippenville Cemetery</td>
<td>PA</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Fuller Family Cemetery</td>
<td>GA</td>
<td>44</td>
<td></td>
<td>Blanchard Cemetery</td>
<td>RI</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Richmond County Cemetery</td>
<td>GA</td>
<td>11</td>
<td></td>
<td>State Institutional Ground</td>
<td>RI</td>
<td>60</td>
<td>X</td>
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<tr>
<td>Pine Ridge Cemetery</td>
<td>GA</td>
<td>14</td>
<td></td>
<td>Hampstead Cemetery</td>
<td>SC</td>
<td>344</td>
<td>X</td>
</tr>
<tr>
<td>Dubuque 3rd St</td>
<td>IA</td>
<td>811</td>
<td>X</td>
<td>Son Cemetery</td>
<td>SC</td>
<td>11</td>
<td></td>
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<td>Mitchell Rd Cemetery</td>
<td>IL</td>
<td>15</td>
<td></td>
<td>Mason Cemetery</td>
<td>TN</td>
<td>35</td>
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<tr>
<td>Vandawerker Burials</td>
<td>IL</td>
<td>11</td>
<td></td>
<td>Read Family Cemetery</td>
<td>TN</td>
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<td>IL</td>
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<td></td>
<td>Ridley Cemetery</td>
<td>TN</td>
<td>47</td>
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<td>Thurston Cemetery</td>
<td>IL</td>
<td>21</td>
<td></td>
<td>Dawson Cemetery</td>
<td>TX</td>
<td>63</td>
<td>X</td>
</tr>
<tr>
<td>Grafton Cemetery</td>
<td>IL</td>
<td>163</td>
<td>X</td>
<td>Tucker &amp; Sinclair Cemetery</td>
<td>TX</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Bowling Cemetery</td>
<td>IL</td>
<td>199</td>
<td>X</td>
<td>Adam's Family Cemetery</td>
<td>TX</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Stellwagen Cemetery</td>
<td>IL</td>
<td>15</td>
<td></td>
<td>Coffey &amp; Boothill Cemetery</td>
<td>TX</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Douthitt Cemetery</td>
<td>IN</td>
<td>11</td>
<td>X</td>
<td>Guinea Rd Cemetery</td>
<td>VA</td>
<td>34</td>
<td>X</td>
</tr>
<tr>
<td>Bennett Cemetery</td>
<td>KY</td>
<td>56</td>
<td>X</td>
<td>Wrenn-Hutchinson Cemetery</td>
<td>VA</td>
<td>43</td>
<td>X</td>
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<tr>
<td>Horse Park Cemetery</td>
<td>KY</td>
<td>31</td>
<td>X</td>
<td>Oliver Family Cemetery</td>
<td>VA</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Branham Cemetery</td>
<td>KY</td>
<td>24</td>
<td>X</td>
<td>Weir Family Cemetery</td>
<td>VA</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Campbell County Cemetery</td>
<td>KY</td>
<td>15</td>
<td></td>
<td>Evans Cemetery</td>
<td>WV</td>
<td>101</td>
<td>X</td>
</tr>
<tr>
<td>1st Cemetery of St Peter</td>
<td>LA</td>
<td>29</td>
<td>X</td>
<td>Reynold's Cemetery</td>
<td>WV</td>
<td>32</td>
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Table 2: UK Cemeteries Used in This Study

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<tr>
<th>CEMETERY</th>
<th>LOCATION</th>
<th>N=</th>
<th>CEMETERY</th>
<th>LOCATION</th>
<th>N=</th>
</tr>
</thead>
<tbody>
<tr>
<td>King's Lynn Quakers</td>
<td>King's Lynn</td>
<td>32</td>
<td>St. Peter</td>
<td>Wolverhampton</td>
<td>149</td>
</tr>
<tr>
<td>King's Lynn Baptists</td>
<td>King's Lynn</td>
<td>19</td>
<td>St. Hilda</td>
<td>South Shields</td>
<td>183</td>
</tr>
<tr>
<td>St. George</td>
<td>Bloomsbury</td>
<td>113</td>
<td>Chelsea Old Church</td>
<td>London</td>
<td>193</td>
</tr>
<tr>
<td>Kingston on Thames Quakers</td>
<td>Kingston on Thames</td>
<td>360</td>
<td>St. Luke's Old St</td>
<td>London</td>
<td>891</td>
</tr>
<tr>
<td>St. Peter Le Bailey</td>
<td>Oxford</td>
<td>172</td>
<td>Spitalfields</td>
<td>London</td>
<td>421</td>
</tr>
<tr>
<td>Baptist Chapel, Littlemore</td>
<td>Oxford</td>
<td>29</td>
<td>St. Pancras</td>
<td>London</td>
<td>631</td>
</tr>
<tr>
<td>Poole Baptist Church</td>
<td>Poole</td>
<td>101</td>
<td>St. Bride’s, Fleet St</td>
<td>London</td>
<td>443</td>
</tr>
<tr>
<td>Sheffield Cathedral</td>
<td>Sheffield</td>
<td>165</td>
<td>New Churchyard, Broadgate</td>
<td>London</td>
<td>143</td>
</tr>
<tr>
<td>Carver St Methodists</td>
<td>Sheffield</td>
<td>130</td>
<td>St. Benet Sherehog</td>
<td>London</td>
<td>187</td>
</tr>
<tr>
<td>St. Paul's, Pinstone St</td>
<td>Sheffield</td>
<td>14</td>
<td>City Bunhill Burial Ground</td>
<td>London</td>
<td>239</td>
</tr>
<tr>
<td>St. Martin in the Bullring</td>
<td>Birmingham</td>
<td>505</td>
<td>Crossbones Burial Ground</td>
<td>London</td>
<td>148</td>
</tr>
<tr>
<td>Priory Yard Baptists</td>
<td>Norwich</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
The samples used in this study are enumerated in Tables 1-2. Seventy-three cemeteries had suitable sample size (≥10) and age categories to facilitate the comparison of infants (0-1.9 Years), children (2-17.9 Years), and adults (18+ Years). Two cemeteries with no infants were studied for their child mortality and age-specific mortality. In addition to these general age groups, 19 North American cemeteries and all 23 British cemeteries utilized more precise (i.e., age-specific) categories (0-1.9 Years, 2-11.9 Years, 12-17.9 Years, 18-34.9 Years, 35-49.9 Years, and 50-99.9 Years). Although infant mortality is usually defined as occurring in the first year of life only, and although one-year intervals are typically used in the youngest cohorts for demographic purposes (Chamberlain, 2006), the variable age categories yielded from osteological recording in the cemetery reporting precluded this. In model populations where overall life expectancy is relatively low, the mortality in the youngest age group (0-1.9 Years) should still be sufficiently high to enable their comparison with Model West life tables without distorting the effects of infant mortality (Coale and Demeny, 1983; United Nations, 1982). Such tables are experimentally-derived mortality profiles for different population types in developing countries. Juxtaposition of osteological mortality against life tables indicates whether the mortality pattern of the sample falls into one of several realistic ranges, or whether it displays abnormal traits (Coale and Demeny, 1983).

Where intermediate age categories were used (e.g., 10-13 Years), or some individuals within the cemetery fell into a nominal class (i.e. adult, infant, child), they were divided and apportioned into refined age categories. The number placed in each category using this method was weighted according to standard attritional mortality patterns; generally, in historical populations this is a bimodal curve with the highest mortality peak in early infancy and a lesser peak at the point in middle adulthood where increased risk meets declining survivorship (Acsadi and Nemeskeri, 1970; Chamberlain, 2006). While this introduces the potential for slightly skewing the appearance of mortality within a discrete category to
seem more demographically typical, it prevents the distortion of mortality across all categories by preserving the size of the sample and the ratios of broad age categories.

Many of the UK cemeteries had sample sizes of ≥100. Because sample size from US cemeteries was often quite small, they were studied individually and then aggregated into 18 states for comparison with the overall UK trends. Studying both small and aggregated samples is useful as localized population trends can be masked in larger samples, such as censuses (Bagnall and Frier, 1994), yet archaeologists frequently need to understand the composition of the smaller cemeteries they work with. Thus, much can be learned if the mortality demonstrated in the small samples is in accord with that of the larger ones. United States cemeteries with sample sizes of 100 or more were also examined as a group, to ensure that conglomerating samples was not artificially creating the appearance of plausible, yet misleading mortalities. The aggregated states and their sample sizes are presented in Table 3. These states were then subdivided into five geographic regions: the Northeast, the Mid-Atlantic, the South, the Southwest and

<table>
<thead>
<tr>
<th>Table 3: Samples Aggregated by US State</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE</td>
</tr>
<tr>
<td>Alabama</td>
</tr>
<tr>
<td>Arkansas</td>
</tr>
<tr>
<td>Arizona</td>
</tr>
<tr>
<td>California</td>
</tr>
<tr>
<td>Georgia</td>
</tr>
<tr>
<td>Illinois</td>
</tr>
<tr>
<td>Iowa</td>
</tr>
<tr>
<td>Kentucky</td>
</tr>
<tr>
<td>Louisiana</td>
</tr>
</tbody>
</table>

| STATE | N= |
| Missouri | 42 |
| New Mexico | 66 |
| Pennsylvania | 583 |
| Rhode Island | 71 |
| South Carolina | 355 |
| Tennessee | 123 |
| Texas | 101 |
| Virginia | 111 |
| West Virginia | 128 |

<table>
<thead>
<tr>
<th>Table 4: Samples Aggregated by Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGION</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>United Kingdom</td>
</tr>
<tr>
<td>Northeastern US</td>
</tr>
<tr>
<td>Mid-Atlantic US</td>
</tr>
<tr>
<td>Southern US</td>
</tr>
<tr>
<td>Midwestern US</td>
</tr>
<tr>
<td>Southwestern US</td>
</tr>
</tbody>
</table>
the Midwest (Table 4). Because of its comparatively small landmass, the UK was considered as a sixth single region. In addition to experimenting with an even larger sample size, this enabled the comparison of mortality by region, a strategy that may influence both attrition and skeletal preservation. Mortality may change by region owing to increased risk posed by epidemic, environmental factors, population density, and social factors (Acsadi and Nemeskeri, 1970). Taphonomic preservation may alter with seasonal precipitation, soil drainage, and heating/freezing cycles (Buckberry, 2000).

RESULTS:

**General Infant Mortality**

Infant mortality in the UK cemeteries ranged from 2 to 50% (Figure 1). In the 18 aggregated US states, it ranged from 3 to 46% (Figure 2). More than two-thirds of the UK groups had an infant mortality (0-1.9 Years) of 13% or below (Figure 3). The remainder were ~20% and above, with a small group of outliers between 35-50%. Child mortality ranged from 6-28% with dual modes of 16 and 20%. Though averages for both infant and child mortality were 16%, the majority of samples displayed child mortality of ≥15% and infant mortality of ≤15%.

By contrast, average aggregated US infant mortality was 25%. This closely matched the profile of the non-aggregated cemeteries, showing that sample size was not the prime determinant guiding the appearance of mortality. Three discrete ranges of mortality clusters make a broad distribution from 10 to 25%, a peak at ~30-35% and a few higher outliers (Figure 3). This pattern was visible in both the individual and aggregated comparisons. Within the 47 US cemeteries including children, child mortality ranged from 3-53%, with an average of 25%, and dual modes of 19 and 29%. The range of child mortalities was more continuous than infant mortality, with the only slight differentiation being between the ranges of 10-25%, and 30-40%.
Figure 1: Proportion of Infant (0-1.9 Years) Mortality in 21 UK Cemeteries

Figure 2: Proportion of Infant (0-1.9 Years) Mortality in 18 Aggregated US States
Age-Specific Infant Mortality

Forty-two cemeteries were examined for age-specific mortality and compared to expected mortality profiles from Model West life tables. A typical attritional mortality profile in a historic population displays a bimodal curve with the greatest peak during infancy (0-1.9 years), and a smaller peak at the most typical age of death in adulthood (anywhere between 35-80 years). Common variations in such profiles include a peak in early childhood (~2-5 years) in tandem with, or in lieu of a peak in infancy. Either infant or early childhood peaks may also be accompanied by a peak in early adulthood (18-30 years).

In comparison with life tables, all but four cemeteries could be fitted to a model with some accuracy. The most common were Levels One, Five, and Nine, with average life expectancy at birth (E0)
between 20 and 40 years and annual growth rate (r) of 0.5%. All plausible-mortality cemeteries exhibited either peaked infant mortality, peaked child mortality, or a combination of peaked infant/child mortality and peaked early adult mortality. Irregular mortality profiles were linear (ascending). Three examples of the commonly occurring plausible mortality profiles, and an example of an unlikely linear profile, are shown in comparison with a Level Five Model West profile in Figure 4.

Figure 4: Examples of Three Plausible Mortality Profiles and One Abnormal Profile Derived from Cemeteries Studied

A summary of the modality of the different mortality curves for US and UK cemeteries is presented in Table 5. Fewer UK cemeteries had strong peaks in infant mortality than in the US. Of the US cemeteries with infant mortality peaks, 37% had corresponding peaks in early adult (18-34.9 Years) mortality. In contrast, the UK had more cemeteries exhibiting heightened child mortality (52%), of which 30% also displayed peaks in early adulthood. Only 16% of US cemeteries had high peaks in child mortality, and 5% had corresponding peaks in early adult mortality. The overall percentage of early adult mortality was 10% higher in the US than the UK. The remainder of the cemeteries displayed variable geriatric mortality at 35 years or above.
Table 5: Percent of the Population Expressing Age-Specific Modality (Peak) Combinations in Cemetery Mortality Profiles

<table>
<thead>
<tr>
<th></th>
<th>Infant/Geriatric</th>
<th>Child/Geriatric</th>
<th>Infant/Early Adult</th>
<th>Child/Early Adult</th>
<th>Infant &amp; Child/Early Adult</th>
<th>Slightly Linear</th>
<th>Strongly Linear</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>37%</td>
<td>16%</td>
<td>37%</td>
<td>5%</td>
<td>--</td>
<td>--</td>
<td>5%</td>
</tr>
<tr>
<td>UK</td>
<td>22%</td>
<td>22%</td>
<td>4%</td>
<td>17%</td>
<td>13%</td>
<td>9%</td>
<td>13%</td>
</tr>
</tbody>
</table>

Few cemeteries in either country had abnormally strong ascending linear mortality profiles arising from a veritable exclusion of infants and lesser inclusion of children, along with an incremental increase in the adult age categories. These profiles are suggestive of an under-enumeration of the young owing to age-specific burial exclusion or taphonomic loss. The remainder of profiles show mortality peaks in the following periods: a) death in early infancy (prior to a year), b) death in late infancy/early childhood (around 2-3 years), c) most common age(s) of death in adulthood.

In those cemetery reports where more precise aging was used, and comparison with burial records was possible, infant death often occurred before the sixth month. Early child death commonly occurred late in the first year to the middle of the second year. Congenital factors or unsanitary birthing practices are often implicated in deaths within the first six months (Acsadi and Nemeskeri, 1970; Kuehn, 2008; Meckel, 1990; Newman, 1906), and may be primarily responsible for the first of these mortality categories. Between the ages of six months and four years, unsanitary weaning practices are a common cause of death (Newman, 1906); the second mortality category likely includes many of these. Accident, respiratory ailment, or epidemic is increasingly implicated after the age of three or four years; however, fewer of these deaths were evident in the cemetery samples. Some of the urbanizing and frontier environments did exhibit such mortality profiles, perhaps suggesting these causes.

**Region-Specific Infant Mortality**

To explore the possibility that taphonomic factors may strongly influence cemetery preservation (Buckberry, 2000; Djuric et al., 2011), or that mortality patterns may correlate with climatic conditions which alter the spread of epidemics (Acsadi and Nemeskeri, 1970; Newman, 1906), infant mortality was
studied by region. The US was divided into five geo-climatic regions, and compared to the UK as a whole. Average infant and child mortality by region is presented in Figure 5.

The range of infant mortalities (0-1.9 years) was similar in all areas apart from the Southwest US, which began at a higher percentage and was around half the range of every other region. Maximum infant mortality was similar in all areas. The range of child mortalities (2-17.9 years) was consistent in its minimum across all regions, but varied over 20% at its maximum between regions. Typically, the range of child mortality was narrower than the corresponding region’s infant mortality. Both average infant and child mortality were lowest in the United Kingdom, however its range was greatest and highest in this area.

Figure 5: Range of Infant and Child Mortality and Their Averages by Region

Average infant mortality was highest in the Southwest United States. Average infant and child mortality were similar to one another within the UK, the Midwest, and the Southern US. In other regions, infant mortality differed from child mortality. No two regions shared the same average infant mortality.
There was no obvious correlation between region and the appearance of infant or child mortality. For infant mortality, the coldest regions (UK and the Northeast) had similar ranges, but drastically different averages. This range was also similar to the much hotter Southern US, and the transitional Mid-Atlantic. The hottest regions (Southern and Southwest US) had dissimilar ranges and averages.

**DISCUSSION:**

Average infant mortality for the US was 25%, and 16% for the UK. The range of infant mortalities observed was almost identical between the UK (2-50%) and the aggregated samples from the US (3-46%). Figures on the lower end of this spectrum are somewhat unlikely given what is known about birth rates and living conditions in pre-Jennerian populations, i.e., those prior to the widespread use of inoculation (Barbieri 2001; Monnier, 2001). Despite this, the most commonly occurring infant mortalities (~10-35%) are on average lower than the “high” estimates previously believed. The outlying high mortalities (above ~35%) are still realistic, but may represent more catastrophic circumstances (Acasadi and Nemeskeri, 1970; Meckel, 1990; Newman, 1906). It is likely that some loss occurs to cemeteries through taphonomy and partial sampling, meaning that even plausible observed mortalities are not a perfect representation of the buried group (Buckberry, 2000; Murphy, Forthcoming). Furthermore, this shows that a variety of possible mortalities may be witnessed at different sites.

Typically, a 10-15% difference between at least two distinct ranges of infant mortalities was seen in inter-cemetery comparisons. Sixty-seven percent of the UK samples had an infant mortality of ≥10%, with 48% of all samples falling between 10-20% infant mortality. A second cluster of three samples had comparatively high mortalities (35-50%). The remaining 30% of samples fell just under 10%, suggesting under-enumerated infants. The US was split more clearly into two distinct ranges, with a small quantity of samples in a third, high mortality group. Thirty-nine percent of aggregated US samples had an infant mortality of 30-35%, while 33 percent demonstrated an infant mortality of 1020%.
These wide ranges and apparent mortality clusters suggest that separate mortality profiles exist within different geographically proximal groups and perhaps within individual population types. The specific cause of these varying profiles is not clear. One possibility is cemetery composition. In a small family cemetery, one might expect to find a disproportionate number of the very young and the very old as those of reproductive age migrate away, and perhaps migrate back for burial in their later years (Chamberlain, 2006). In a newly expanding city, an increased number of the unmarried may skew the composition of the population to early adulthood. Different environments may affect mortality in unpredictable ways: in urban settings, crowding and pollution may be combatted to some extent by access to work and modern amenities, where in frontier towns, lack of infrastructure, lawlessness, and lack of medical attention may negate the benefits of living space (Meckel, 1990; Newman, 1906). Additionally, within any community, the economic status of those buried may affect their mortality either through deficiency diseases, professional hazards, epidemics, or diseases of excess (Acsadi and Nemeskeri, 1970).

These statements are borne out to some extent by the examination of more detailed age-specific mortality profiles within cemeteries. Closer examination yielded peaks in mortality at different ages, which could often be understood in terms of lifestyle factors described in the associated reports. These include the presence of certain epidemics, pressures from urbanization, cemetery use-duration, and interpersonal violence. A variety of disparate yet plausible age-specific mortalities were thus observed in samples of different sizes. The mortality shifts most commonly witnessed were threefold. First, mortality was observed to vary in early childhood between neonatal, later infant, and early childhood mortality. This is likely owing to congenital disease and birthing practices in the first group, weaning hazards in the second, and risk of accident and epidemic in the third case (see Acsadi and Nemeskeri, 1970; Meckel, 1990; Ruttiman and Loesch, 2012). Secondly, in many samples, mortality rose prematurely in early adulthood. This may correspond with violence, dangerous professions, or parturition risks to women.
(Acsadi and Nemeskeri, 1970; Heilen and Grey, 2010). Finally, the average age of the geriatric differed somewhat across all samples.

Of the 19 US cemeteries with age-specific mortalities, only three (5%) had moderately “abnormal” mortality profiles. These cemeteries display almost linear increases in mortality, typical of age-preferential burial inclusion. The fact they are geographically distant from one another, with other “regular mortality” cemeteries closer by, argues against purely taphonomic explanations. Twenty-two percent of UK samples demonstrated atypical mortality profiles, however only two of these (9%) were strongly linear. This pattern also correlates with Baptist and Quaker burial practices rather than with preservation influences. In the UK, average early childhood mortality was slightly higher than in infancy. Across the US, death in infancy was more common. In both countries, there appears to be a minor correlation between infant/child death and death in early adulthood, perhaps suggesting a link between loss of caregiver or contagion as a cause of early life mortality.

There was a minor positive correlation between sample size and higher infant mortality in the US. Most US cemeteries with an individual sample size of ≥100, as well as aggregated states, had an infant mortality of 30% or greater. However, this trend was not linear; the largest cemeteries did not demonstrate the highest mortalities, nor did all large cemeteries display high mortality. Despite larger UK sample sizes, no corresponding correlation was observed. Though infant mortality ranged from 250%, four of the largest samples shared an infant mortality of only 13%. This suggests that factors like population growth and social-environmental conditions may correlate with heightened infant mortality, rather than increased mortality being an artifact of sample size. For example, although derived from a more populous city than remote Santa Fe or industrializing Pittsburgh, London samples in this study often demonstrated lower mortality.

No strong link could be found between climatic region and infant mortality. As previously noted, a wide range of infant and child mortalities was observed across both countries. This was also true across
geographic areas. The wider range and generally lower averages of infant mortalities in long-settled areas, compared to the frontiers of the Midwest and the Southwest may suggest that perhaps settlement patterns are a greater indicator of mortality risk than climate itself. The western communities were rapidly expanding cities on the outskirts of “civilization”, while more easterly regions may have had greater infrastructure. Likewise, the higher early life mortality in the US as compared to the UK may have arisen from the more recent industrialization and changing migration patterns of the US.

CONCLUSIONS:

In the past, it has been common to assume that infant mortality observed in an isolated excavated cemetery is either higher or lower than the “true” mortality of the buried population. The comparison of these similar, yet “disparate” datasets has clarified the complexity behind populations displaying identical mortalities with different causes, and identical environments that display opposite mortalities. Average infant and child mortalities in historic cemetery samples are 25% in the US and 16% in the UK. A variety of realistic mortality profiles exist within the large range of these groups, with characteristic variations occurring between infant, child, and early adult mortality peaks. Infant mortality figures of <10% are less likely. However, figures of around 10-35% may be typical of the period, this corresponds with the findings of historical demographers (Newman, 1906; Ruttiman and Loesch, 2012; Wrigley and Schofield, 1989). No apparent correlation exists between climatic region and the appearance of infant mortality. Together, these factors imply that taphonomic factors may not have the strong negative effect on infant preservation once thought, and that climatic factors are not the primary determinant of infant mortality. There is a minor association between larger urban samples and infant mortality. Coupled with the heightened mortality in newer, expanding communities, this may suggest that settlement patterns, man-made environmental factors, and population growth are the biggest predictors of infant mortality.

In an attempt to reduce the variables present in this study, only cemeteries with high percentages of European ancestry, and so-called “normal” populations were included. It would be worthwhile to
extend this study to see whether the appearance of mortality differs dramatically in other types of populations. While numerous factors may influence the appearance of mortality within a cemetery, most are dependent on too many variables to confidently state causality in this study (Chamberlain, 2006). The most prominent of these are probably prior cemetery disturbance and differential skeletal preservation, which both have the potential to impact the question, yet are difficult to quantify (Buckberry, 2000; Djuric et al., 2011; Lewis and Gowland, 2007). It was beyond the purview of this project to thoroughly assess the different environmental and socio-economic circumstances of each cemetery group. It would be useful to compare these cemeteries to censuses and historical records for a more thorough understanding of the dynamics that may be responsible for different mortality profiles. Finally, taphonomic factors play an important role in the preservation of cemetery samples and the data that can be gleaned from them (Buckberry, 2000; Djuric et al., 2011; Lewis and Gowland, 2007). More in-depth study of the effect that preservation has upon the appearance of mortality is necessary to be confident that cemetery mortalities are reliable.

This study clearly shows that historic cemetery reports and archival records are rich sources of data for addressing questions about past cultures. With a relatively small sample, it was possible to explore mortality by age, region, climate, sample size, and social structure. These are only a few areas of inquiry that can be addressed with these “disparate datasets”. Historically, such sources have been overlooked, or have not been combined. This is because researchers are constrained by the perception that only certain datasets fall within their specialization, or they become preoccupied with cultivating new methods and projects in search of “new data”. Datasets need not be novel or radical to be profoundly useful; often reopening “long-resolved” debates using a fresh perspective and overlooked sources is sufficient.
WORKS CITED


Chapter 7: Lost, But Not Alone: Burial records as a means of determining absolute taphonomic loss by age in cemetery populations.

INTRODUCTION:

From the previous study, it can be said that archaeologically excavated populations do not demonstrate universally “high” infant mortality in the historic period. Rather, a wide range can be seen. This confirms the trends demonstrated in historical and modern writings on demographic mortality studies: namely it is variable even within a single time period, even between genetically and geographically similar groups (Acsadi & Nemeskeri, 1970). The range demonstrated in this study is also in keeping with experimentally demonstrated ranges of infant mortalities from model life tables (Coale & Demeny, 1983), and so can be said to be “plausible”. But does that mean that observed archaeological mortalities from excavated populations are also “true”? In studies of this kind, it is important to remain mindful of the fact that burial records may be incomplete (Herring & Swedlund (eds), 2003). Where burial sampling is partial, as was the case in many cemeteries studied, it is also crucial to remember that the sample may not be truly representative (Lewis & Gowland, 2007). The effects of this may be mitigated by being heedful of the parameters of the sample, as well as by studying mortality as a proportion of the population, and by the comparison of proportional mortalities between burial and other vital records and osteological samples from excavation to see if they remain consistent.

Concordant with the work of early demographers in England, the infant mortality rate in English cemeteries is most commonly in the low to mid-teens (Newman, 1906; Wrigley & Schofield, 2009). This corresponds with many of the mortalities observed in the current study. These results are promising, but can they be said to be reliable across populations with unknown initial mortalities?

The original demographic goal of this paper was to resolve the question of whether excavated archaeological populations displayed reliable mortality profiles compared to their initial mortality, as determined by burial records. The particular focus of this was in the infant age category, as it is typically stated that infant remains survive more poorly than those of older individuals. However, the relative loss of adults or children has never been experimentally demonstrated either. This information is potentially valuable to all archaeological excavations because it enables researchers to understand what percentage of their original burial population is likely to be lost after excavation. While demographics enable archaeologists to determine whether the mortality they observe is realistic, more information is needed to say whether any single age category has been disproportionately altered by unknown taphonomic forces.
This knowledge prevents the misinterpretation of realistic-looking mortality profiles, which could nevertheless be completely nonrepresentative of the population in questions if taphonomic forces alter age groups at substantially different rates.

If it is known what percentage of a population or age category is lost, the causes can be more adequately addressed. If infants “disappear” from the buried population for example, is it owing to taphonomic forces or differential burial such as shallower grave depth? If all age groups disappear at a high rate, or at a high rate at some sites, is it because of climatic conditions such as variable rainfall, freezing patterns, drainage or soil acidity? In order to approach such causality, it must first be established at what rate loss to infants and children may be occurring. The following paper attempts to address this question.
Lost, But Not Alone: Burial records as a means of determining absolute taphonomic loss by age in cemetery populations.

AMANDA MURPHY

This paper was presented in the Fall of 2014 at the Cultural Heritage and New Technologies conference in Vienna. It is published in Proceedings of the 19th International Conference on Cultural Heritage and New Technologies.

The rate of loss of human bone in burial contexts is a topic which is of interest to archaeologists and forensic scientists alike. In excavated cemeteries, it is frequently contended that large portions of the initial burial population, especially children, are rapidly lost through taphonomic processes. Burial records are one underutilized means of assessing this attrition in cemetery populations. Such records provide a glimpse into the health risks of the population and furnish an initial mortality estimate, which allows for the study of taphonomic loss. Three excavated historic period cemeteries (St. Benet Sherehog, London N=230; Alameda Stone, Tucson N=1166; and the Voegtly Cemetery, Pittsburgh N=546) were compared to associated parish burial records (St. Benet Sherehog N=1513; San Agustin N=5099; and Voegtly Church N=806). The resulting mortality profiles were fitted against Model West life tables. Though very demographically different from one another, all cemetery records demonstrated plausible infant (0-1.9-year-old) mortality rates, ranging from a relatively high 52% to a moderate 21%. Mortality estimates derived from the osteological evidence in this age category were consistently 5-10% lower than those obtained from burial records for the same cemetery. The absolute loss of individuals varied markedly between samples. However, it was found to be quite similar across age groups within each cemetery, with attrition in the infant category only 3-15% greater than losses among adults.

INTRODUCTION:

The extent of taphonomic loss to human bone in burial environments is poorly understood. It is frequently argued that child and infant remains do not survive in burial contexts as well as adult remains (Baker et al., 2005). This is confounding to archaeologists, as it is widely accepted that infant mortality, and therefore infant remains as a proportion of the total quantity of skeletal remains buried in cemeteries, must have been much greater in historic and ancient populations than it is today (Sainz de la Maza Kaufman, 1997; Caldwell, 1996; Guy et al., 1997; Caldwell & Caldwell, 2003; Lewis & Gowland, 2007). Despite repeated assertions that infant mortality was high, much like taphonomic loss, its extent has never been fully quantified. In skeletal samples from excavated cemeteries, infants have been found to make up 30% of the population or less (Buckberry, 2000). While this is not as low as modern estimates of infant mortality, it is not as high as the estimates of ~35-40% and above which have been postulated by archaeologists and historical demographers (Coale & Demeny, 1983; Caldwell, 1996; Hollingsworth, 1968; Lewis & Gowland, 2007). The persistent feeling that child mortality is in some way unknowable hampers the demographic study of ancient populations. If infant mortality is consistently thought to be “high”, while recovery from cemetery contexts is demonstrably “low”, a paradox is created in which it is extremely difficult to study the material culture of burials, such as what
proportion of bones might be lost through natural processes and physical disturbance; and correspondingly difficult to study larger demographic questions, such as what proportion of infants may have died at a particular age via weaning hazard or through accident. These two types of questions are important to our understanding of post-mortem osteological processes, as well as the wider study of ancient populations.

Comprehension of taphonomic processes is crucial to a number of fields. People have long been debating the survivability of bones in post-mortem contexts, from both the very recent perspective of forensic science to the more venerable time-scale of paleontological research (Mant, 1987; Archer, 2004; Morton & Lord, 2006; Carter et al., 2008, 2010; Urrahy-Rodriges et al., 2008; Stokes et al., 2009; Ross & Cunningham, 2011; Ubelaker & Zarenko, 2011; Von Endt & Ortner, 1984; Sillen, 1989; Willey et al., 1997; Nielsen-Marsh & Hedges, 2000 a & b; Stiner et al., 2001; Denys, 2002; Jans et al., 2004 Nielsen-Marsh et al., 2007; Smith et al., 2007; Turner-Walker & Jans, 2008; Fernández-Jalvo et al., 2010). If infant bones disappear more rapidly and completely, is it owing to chemistry, physical processes, or poor recognition and hence lowered potential for recovery? If infant remains are not lost at a greater rate than those of adults, why has this notion that they are missing persisted for so long? To the credit of archaeologists, the question is not an easy one to resolve. It is known that the decomposition of bone is influenced by a broad range of interacting factors. These include element size; bone density; soil acidity; hydrological conditions; temperature; burial depth and duration; whether the body is buried with adhering flesh; the extent of exposure or preservation of the body before burial; and disturbances ranging from root infiltration, to animal burrowing, to grave reuse, to overbuilding (ibid.).

Though it is frequently argued that infant bones are “poorly mineralized” and break down faster in burial contexts than the bones of adults, no intrinsic rate of loss of infant remains as compared to the remains of older individuals has ever been experimentally demonstrated (Gordon & Buikstra, 1981; Guy et al., 1997). In one of the few attempts to tackle the topic, Djuric and colleagues (2011) concluded that specific element size and density are contributing factors to the breakdown of bone, with small infant elements being the most dramatically affected. However, although their results highlighted the fact that the total number of long bones in their youngest age group was significantly lower than in the two older categories, they ignored the fact that the youngest age category actually included the most individuals; smaller specific element size (e.g. humeri versus tibiae) did not seem to correspond with poorer preservation within an age group; and that the 4-7 year-old group actually contained a substantially greater number of preserved long bones than the 8-14 year old group.
In a study of preservation by age and sex in large osteological samples, Bello and colleagues similarly observed an age threshold at 5 years old, below which preservation appeared to be poorer in general (2006). The researchers also found that preservation was poorer among infants, regardless of element size/density, suggesting that something apart from the intrinsic state of infant bone that is responsible. Despite this, the osteological samples they studied typically included insufficient sample sizes of young infants to make sound statistical arguments, possibly skewing their results. Later studied were unable to replicate their results in Medieval populations (Manifold, 2013) Other studies have shown that certain specific elements, such as distal phalanges, sterna, and vertebrae, survive more poorly in burial contexts than others (ibid.). This appears to be true regardless of the age of individual yielding them, or the overall preservation of the remainder of the skeleton. These results may be linked to scavenging, mobility of small skeletal elements in the burial environment, or the non-recognition of small elements by excavators rather than because of the bones’ intrinsic properties (Duday, 2009; Mays et al., 2012). As such, it seems likely that if intrinsic qualities of different bone at different ages affect decomposition, it is part of a much larger tapestry of variables contributing to bone loss.

Burial inclusions meant to protect the body may actually speed its decomposition. For example, permeable coffins may act as water caches, periodically soaking and drying the body. Sawdust used to cushion the corpse and absorb fluids during the funeral stage may create a composting effect (Acsadi & Nemeskeri, 1970; Boddington et al., 1987; Bello, 2006; Buckberry, 2007). Conversely, artefacts containing copper, which have antimicrobial properties, may have a protective result where they touch the body. Sealed Fisk-type coffins may preserve even the soft tissue for hundreds of years (Leader et al., 2001). It is possible that distinct burial traditions reserved for infants, such as shallower burial, bulky organic burial dresses or swaddling, and the use of thinner, more permeable coffin materials could result in their loss, without their bones being inherently more fragile. Such expedient differences between adult and child burial are also sufficiently incidental that the practitioners themselves might not consider them to be “different” enough to comment on in historical accounts of burial practices. An alternative explanation is that infant bones are not as easily recognized by excavators. Before the advent of refined osteological aging techniques, the study of infants was more difficult. In the 19th century excavation of some Neolithic British tombs, excavators who were otherwise qualified to make specific statements about adult remains confused infant remains with small animals and vice versa (Smith & Brickley, 2006; Whittle et al., 1999; Whittle & Wysocki, 2007). During the early development of biological anthropology in the 1950s, the ubiquitous field of craniometrics excluded infants because their skulls
were unsuitable for that particular avenue of research. As a result, infants and the adult post-cranial skeleton were frequently not studied, and sometimes purposefully left unexcavated. Although researchers have now acknowledged the importance of infant and child remains, particularly for the precise age estimates that they may yield, they may still be overlooked during excavations. In addition to the possibility of intrinsic differences between adults and children, infants are more easily disarticulated due to smaller size, incomplete epiphyseal fusion, and shallower burial (Buckberry, 2000). They remain less distinct to the eyes of non-specialists than adult bones, and there is no requirement in either the U.S. or the U.K. that trained biological anthropologists be present during the excavation of burials (Mays et al., 2012). Also, in the UK current guidelines for the analysis of human bones from archaeological sites state that “disarticulated bone is not usually considered worthy of study at the analysis phase” (Mays et al., 2015: 5), implying that disturbed infant burials are likely to be excluded from censuses of skeletal remains. Finally, the graves of infants may be smaller and in less prominent locations than those of adults (Finlay, 2000). All of these factors may be wholly or partially responsible for the limited number of infant remains which have been observed to be retrieved from cemeteries.

Demographic concerns are inseparable from the larger questions that archaeology attempts to answer. Were ancient peoples healthy? How did they give birth? When did they wean their children? Were young children left to fend for themselves against accident or assault? At what age did people begin to mourn the loss of their young? Infants and young children, in addition to being the key to many of these intriguing problems, are one of the best indicators of the overall health of a population. Furthermore, the demographic structure of a population, such as life expectancy, cannot be comprehended in a juvenile data vacuum (Chamberlain, 2006). Infant mortality is defined as the proportion of live-born infants who die within the first year of life. Modern infant mortality may be as low as 0.02% in affluent countries like Sweden, while being as high as 50% in the developing world (Barbieri, 2001; Matthews & MacDorman, 2007; Kuehn, 2008; DOI, 2012). While it is believed that infant mortality was necessarily higher in more ancient populations, factors associated with urbanization such as epidemics, respiratory risks, lack of sanitation, and maternal stress/neglect may actually have made mortality peak at unusually high levels just as population statistics began to be closely monitored. Infant mortality was observed to have risen markedly during the industrial revolutions in the United States and United Kingdom, however demographic record keeping prior to this period was limited (Hollingsworth, 1968; Meckel, 1990; Lewis, 2002; Lewis & Gowland, 2007; Ruttiman & Loesch, 2011).
Previous attempts to study demography and preservation via archaeological means have been limited through the selection of flawed or unsuitable samples. One of the most commonly cited of these studies is the work of Walker and colleagues (1988), which compared burial records and osteological data in an attempt to study the influence that age and sex had on the preservation of the human skeleton. Using burial records for La Purisma Mission (1813-1849 AD), they concluded that the age structure of the excavated cemetery was inconsistent with that observed in the burial records. However, only 2% of the cemetery was excavated and studied. The resulting sample size (N=32, N=2 <18 years of age) was small and likely to have been based on selective excavation. The burials included clergy of European extraction, but were largely comprised of Native American converts: many unwilling. In this environment, post-burial theft of remains in order to subject them to Native burial rituals is a possibility. To assess the accuracy of their findings, La Purisma was then compared to an unspecified proportion of a Pre-contact Native population with no burial records (600-1100 AD). Though they concluded that the preservation was similar in both cemeteries, this cannot truly be demonstrated without using a contemporary sample whose initial population structure can be estimated.

Other reports have compared African-American slave cemeteries to middle class Euro-American non-slave burials, or focused on poor houses, hospitals, or military cemeteries with mixed results (Lanphear, 1989; Grauer & McNamara, 1995; Saunders et al., 1995). Such samples are typically studied because of their size and availability. The unwillingness of modern societies to archaeologically study their recent ancestors, and the limited “grey literature” publication of many such reports has made this a persistent issue (O’Brien & Roberts, 1996). Though recent excavation projects have yielded samples which are more comprehensively excavated and published, even many excellent populations cannot be studied in greater depth because of a lack of cemetery records which provide a numerical counterpoint to the excavated population. While it is common to compare regional censuses and mortality schedules to well-excavated cemeteries, it is still relatively rare to use cemetery-specific death records to this end. There are many valid reasons for this, including the total absence or incomplete nature of such records. Where robust records do exist, however, the results are promising. In two recent comparisons of a partially excavated cemetery with vital records, the age and death structures of the population from records and skeletal samples have been found to be consistent (Lanphear, 1989; Grauer & McNamara, 1995). In another study, the number of infants recovered by archaeological excavation actually exceeded the number recorded in documentary sources (Saunders et al., 1995).
Three excellent samples of this nature, which have not yet been compared to one another, are the Alameda Stone Cemetery, Tucson Arizona; St. Benet Sherehog, London UK; and the Voegtly Cemetery, Pittsburgh, Pennsylvania USA (Ubelaker & Jones, 2003; Miles & White, 2008; Heilen & Gray, 2010). These samples are superior to previously compared samples in a number of ways: Firstly, all have fairly thorough associated burials records (Bannerman & Bannerman, 1920; Ubelaker & Jones, 2003; Thiel, 2012). This is important because the use of less closely linked demographic records such as censuses and city wide mortality schedules may give a broader sense of a large population, but may be insufficiently specific to compare smaller populations. For example, family cemeteries can have very high mortality among infants and the elderly, while medium-size frontier towns may show higher mortality among young adults and young children. These are potentially fruitful discrepancies which are masked when they are absorbed by a larger data set such as a county census (Newman, 1906; Bagnall & Frier, 1994). When looking at an isolated archaeological sample, it is useful to be able to trust whether the variation in mortality it displays is realistic, rather than assuming mortality must have been either higher or lower than what is witnessed because it differs from records which are too general.

Second, none of the cemeteries in this study were poor houses, military cemeteries or other selective populations that may show strong age or sex biases. It is a common mistake to substitute a potentially demographically skewed group for an inclusive one because the excavated sample is convenient. Though differing slightly in racial characteristics, city size, and geographical region, the three cities studied were all urban areas, characterized by populations with a large proportion of European influence (Ubelaker & Jones, 2003; Miles & White, 2008; Heilen & Gray, 2010). While Alameda Stone, as a Western center with a military component may have been more skewed toward a young male population, the three populations may be reasonably assumed to have included well-rounded families, rather than a surplus of the infirm (such as hospitals or sanatoriums) working-age males (such as mining camps or the army), or poor, elderly females and infants (such as poor houses, orphanages, or missions).

Finally, all were large, recently excavated samples. Many of the most commonly quoted sources on infant recovery- Walker and colleagues included- were based on samples excavated well before the 1980s. This is prior to the refinement of current osteological aging techniques. Although methodology remains imperfect, frequently causing the over-enumeration of older adults in younger age categories, it now allows for more precise estimations of juvenile age at death. Osteology has also seen recent advances in the study of disarticulated remains, which were formerly regarded as uninformative and
tended to be discarded without further study. Recent samples are therefore superior in that excavators now recognize the importance of excavating and assessing remains as best as possible, regardless of age or preservation.

**METHODS:**

Three historic cemeteries with associated burial records were studied. These were St. Benet Sherehog (N=230); Alameda Stone Cemetery (N=1166); and the Voegtly Cemetery (N=546) (Ubelaker & Jones, 2003; Miles & White, 2008; Heilen & Gray, 2010). The burial records were derived from the Parish of St. Benet Sherehog & St. Steven Walbrook (N=1513), San Agustin Parish (N=5099), and Voegtly Church (N=814) (Bannerman & Bannerman, 1920; Ubelaker & Jones, 2003; Thiel, 2012). The samples ranged in date from 1670 to 1875 with some temporal overlap between all of the burial grounds (Table 1). These cemeteries were chosen because they were large, recently excavated graveyards with thoroughly analyzed and widely disseminated reports. In addition, each of the burial grounds is considered to have been completely excavated. All had associated parish burial records which were fairly complete. This enabled a direct comparison between the osteological sample and an approximation of the demographic composition of the population which was initially buried.

St. Benet Sherehog was a small London Anglican parish whose population was in gradual decline during the use of the excavated cemetery in question (Miles & White, 2008). Located at what is now 1 Poultry (street), the cemetery was excavated in 1994-1996 by the Museum of London Archaeological Service. It is considered that the cemetery was fully excavated. The cemetery records used are the combined burial records from the Parishes of St. Benet Sherehog and St. Stephen’s Walbrook. Of the 1,687 burials recorded, 30% (N=507) were known to have been buried at St. Stephen’s Walbrook, while

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<tr>
<td>Parish of St. Benet Sherehog &amp; St. Stephen Walbrook</td>
<td>1716-1849</td>
<td>1513</td>
<td>London, UK</td>
</tr>
<tr>
<td>San Agustin Parish</td>
<td>1875-1909</td>
<td>5099</td>
<td>Tucson, AZ, USA</td>
</tr>
<tr>
<td>Voegtly Church</td>
<td>1834-1861</td>
<td>814</td>
<td>Pittsburgh, PA, USA</td>
</tr>
</tbody>
</table>
only 5% (N=84) were known to have been buried at St. Benet Sherehog. The remaining 65% have an unspecified burial place in one of the two cemeteries. Although the Post Medieval portion of the cemetery was in use from 1670 onwards to 1850, the burial records spanned only the years of 1716-1850 (Bannerman & Bannerman, 1920). The burials recorded during this time numbered 1,687, however the bulk of these were interred at St. Stephen’s. Of the total burials, 304 had imprecise but salvageable age categories such as infant, child, and adult. A further 156 individuals were excluded from the sample because their ages were completely unknown, leaving a sample size of 1,513. The osteological sample included 187 individuals of known age, and 43 adults of unspecified age, for a total sample of 230.

The Alameda Stone cemetery was the only cemetery serving the population of Tucson, Arizona from around 1851 to 1875 (Heilen & Gray, 2010). When the cemetery was in use, Tucson was an expanding frontier city, characterized by a mixed-race population of railroad workers, ex-soldiers, ranching families, and traders. Excavated in 2006 by SRI Corporation, the minimum number of individuals represented in the skeletal assemblage was 1,166. During the course of this project, the cemetery was completely cleared. Historical exhumations of some bodies took place in 1882 and 1884 shortly after the closure of the cemetery. The construction of the Tucson Newspaper Building in 1953 is also known to have disrupted a number of bodies prior to the excavation of the cemetery. At least 48 individuals were removed during the latter. The number removed during the former is unknown (ibid.).

The burial records used were from the parish of San Agustin, which served the largely Catholic population of Tucson (Thiel, 2012). They include 5,099 individuals. The records were from slightly later period of 1875-1909. However, because of the short use-period of the cemetery, it is unlikely that the composition of the dying population shifted drastically during this time. Alameda-Stone is likely to have had a Catholic section. It is also possible that the Catholic diocese, as the central religious organization of Tucson at the time, recorded a number of the non-Catholic deaths in the city.

The Voegtly Cemetery served a Swiss-German Anabaptist population in Pittsburgh (then Old Allegheny Town), Pennsylvania from 1833-1861 (Ubelaker & Jones, 2003). During the burial ground’s use, the area transitioned from a relatively prosperous Swiss-German suburb to an industrialized melting pot. Excavated in 1987 by GAI Consultants, Inc. and the Smithsonian Institution, it was the earliest field project included in this study. Despite this, its analysis and reporting were very thorough. It is considered to be completely excavated. At least 8 burials were known to have been disturbed or destroyed during construction in 1911, and a further 3 were exhumed after the cemetery’s closure. Though a total of 724 features and 689 individuals were identifiable, bones were present for only 554 of these. Only those
burials with bones present were utilized in this analysis. Nine sets of foetal remains were also excluded from general analysis. Of 896 individuals listed in the Voegtly Church burial records (1834-1861), only 823 were interred at the Voegtly Church (ibid.). Of these, only 806 had a known age at death\(^1\), including 39 with non-specific ages. These individuals make up the sample. It is suspected by the translators of the records that some of these unaged burials, with the notation of “not seen” or “not displayed” may represent stillbirths or miscarriages.

The ages derived from the excavated cemetery populations and the burial records were divided into six age categories: 0-1.9, 2-11.9, 12-17.9, 18-34.9, 35-49.9, 50-99.9 years. These categories were chosen because the reporting of ages in the Alameda Stone Cemetery limited their further subdivision in the adult groups, and because they facilitate useful comparison with other data sets. The juvenile osteological age categories in use at St. Benet Sherehog (“Neonate”, 1-5, 6-12, and 13-17 years) were also a limiting factor. Where they overlapped with the age groups used in this study, they were divided by the number of years in their original category. Some of the individuals were then reapportioned into the younger or older age category as appropriate. Despite lacking the detail to inform changes in preservation which may exist within the first year of life, the age categories in this study were generally suitable to study differences between infants, children, and adults. Analysis of the burial records, which often aged young individuals to the month, enabled a more refined understanding of age-specific mortality within each population. No individuals were included whose ages were estimated with indirect methods, such as those guessed by grave or coffin size. Individuals with completely unknown ages were excluded from both the records and osteological population. In the cases where ambiguous age categories were present, such as “Adult”, “Child” or “Infant”, they were divided and stacked into the most likely age sub-category. This was most prevalent in the burial records for St. Benet Sherehog (Bannerman & Bannerman, 1920).

Because developmental age was not more precisely listed in excavation reports, and death by month in utero could not be assessed, foetal remains were eliminated from the initial osteological analysis. However recorded stillbirths were included in the infant age category, as they were underenumerated and potentially hidden in the burial records from San Agustin Parish and St. Benet Sherehog (Bannerman & Bannerman, 1920; Thiel, 2010). While this has the effect of increasing the

\(^1\) The original analysis of burial records lists 799 individuals of known ages, however 806 was the count found upon re-entry and analysis.
appearance of infant loss, it prevents the accidental exclusion of full term infants who simply did not survive the birthing process in the representation of the population’s initial mortality. Foetal remains recorded during the excavation of St. Benet Sherehog, had been merged with 1-4 week old individuals into a “Neonate” age category in the report. An additional 15% of the 1-5 year old age group from the St. Benet Sherehog report was also stacked into the 0-1.9 year old category during analysis as a conservative approximation of the 5 week to 1.9 year olds who were not more clearly enumerated in the osteological report. This, along with the fact that St. Benet Sherehog shared parish records with St. Stephen’s, is likely to inflate the appearance of loss in the youngest age category.

Table 2: Stillborn Population from Records & Foetal Remains from Excavation

<table>
<thead>
<tr>
<th></th>
<th>Stillborn from Burial Records</th>
<th>Foetal Remains</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Benet Sherehog</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Alameda Stone</td>
<td>2</td>
<td>67</td>
</tr>
<tr>
<td>Voegtly Cemetery</td>
<td>40</td>
<td>9</td>
</tr>
</tbody>
</table>

Once the osteological and parish record data for each site was compiled, it was compared to Model West Life tables to assess the plausibility of its distribution (Coale & Demeny, 1983). Such tables are derived from modern populations with various mortality structures. Three Life Tables, Levels 9, 5, and 1 were used to reflect the different mortality patterns within each population. For all life tables, growth rate (r) was estimated at 0.5% per annum, while average life expectancy at birth (E0) varied, depending on infant mortality and the post-infancy survivorship pattern.

RESULTS:

The three cemeteries studied had widely divergent mortality profiles, each of which was plausible as compared to Model Life tables.

**St. Benet Sherehog:**

The demographic profile of St. Benet Sherehog is presented in Figure 1. Of the three populations studied, it was the healthiest in terms of estimated life expectancy at birth. Although it was not an extremely wealthy parish, perhaps the amenities of a large urban centre made up for some of the difficulties experienced by its industrializing and frontier counterparts in America. The age at death profile reconstructed from the burial records most closely resembled a Level 9 Model Life Table with an average life expectancy at birth (E0) of 40 years and an annual growth rate (r) of 0.5%. It had the lowest
proportion of infant deaths of all the samples (20.8%). Most of these deaths were clustered around the time of birth, indicating unsanitary birthing practices, congenital disorder, or enfeeblement.

Figure 1: Proportional Mortality by Age at St. Benet Sherehog Compared to Model West Life Table 9

The osteological samples of adult individuals displayed an excess of deaths in the 18-35 year age group and a corresponding deficit in the >50 years category when compared to the profile generated from the burial records. This is most likely the result of enumeration errors due to the difficulty of accurately aging individuals ~40 years old and older using skeletal indicators. From the parish records, it is known that many individuals in this community survived well into their 70s and 80s. Compared to the Model West Tables, both early and late life mortality are slightly lower than expected. Despite this, the apparent loss between burial and recovery in the infant age category is the highest of any of the burial grounds studied (~10%). This is most likely because the records include two parishes with two distinct burial places, while only one burial place was excavated.

The Alameda Stone Cemetery:
The demographic profile for Alameda Stone is presented in Figure 2. The Alameda Stone Cemetery was compared with a Level 5 Model West Life Table, with an average life expectancy at birth of 30 years, to reflect the much higher level of infant mortality within this population. At almost 37%, infant mortality
in this population was the second highest in this study. Unlike St. Benet Sherehog, much of Alameda Stone’s infant death was concentrated around the age of a year. This may be associated with weaning hazard and the gastrointestinal diseases which would be expected to disproportionately affect south-western populations.

While overenumeration still occurred in the earlier adult age categories, its extent was not as great as for St. Benet Sherehog. This may be owing to the fact that fewer people in this population survived into advanced age, as well as the fact that St. Benet Sherehog included more “unageable” adult individuals, who were stacked more evenly across the age categories. Compared to the Model West Tables, the profile of adult mortality is slightly abnormal: higher than expected among younger adults, and lower than expected among the elderly. This may reflect the risk of accident and violence in the “Wild West”: a phenomenon which has been observed in neighbouring historical accounts and cemeteries.
The Voegtly Cemetery:

The demographic profile for the Voegtly Cemetery is presented in Figure 3. The mortality profile for Voegtly Cemetery reconstructed from burial records was very similar to a Level 1 Model Life Table, which reflects its very high infant and child mortality (52% and 17% respectively). This was the highest of all the cemeteries, even slightly exceeding the Model Life Table which it most closely matched. Its child mortality (2-11.9 years) was also higher than any other population, dropping off in adolescence (12-17.9 years) to the very low figure of 2%. The appearance of infant mortality in this population may be inflated by the high number of stillbirths recorded in the parish records. As with the other populations, some over-enumeration of young adults and under-enumeration of the geriatric persisted. However, it was less pronounced than in either of its counterparts, due to the proportionally high infant mortality and correspondingly low mortality among the elderly. During this time, Old Alleghany Town had a growing population. It was an emerging centre of trade and manufacturing, which brought with it prosperity as well as increasingly urbanized conditions and labour.
The inclusion of osteologically-determined stillbirths was attempted in order to see to what extent this would diminish the appearance of loss in the infant category. As St. Benet Sherehog’s foetal remains were already merged with infants in the reporting of the osteological sample, no change could be studied. The results are presented in Figure 4. As anticipated, the inclusion of stillbirths in the infant age category reduced the appearance of the loss of infants in both populations. Voegtly Cemetery displayed a 2% difference, while Alameda Stone had a discrepancy of 4% between the two osteological estimates.

The proportional loss or gain of infants from the total cemetery population only reflects one aspect of taphonomic activities. It would be possible, for example, to witness a rise in the proportion of infants from burial to excavation if no infants were lost, while losses to adults were severe. Comparing proportional loss by discrete age group is most useful for determining to what extent the demographic profile of the skeletal assemblage from the cemetery maintains its initial distribution as shown by documentary records. In all examples in this study, proportional change is relatively minor and predictable among the young, but more inaccurate among adults who tend to be incorrectly aged. In order to determine whether infants are actually lost with higher frequency than adults, the percent total
loss or gain from each age category must be studied from the original number in each age category (infant, child, or adult) from the burial records. To determine whether the total loss of infants was comparable to the loss of adults and children, the 2-17.9 year olds were grouped together, and all adult age categories were grouped. The loss within each age group was then tabulated. The results are presented in Figure 5.

Figure 5: Absolute Loss Among Infants, Children, and Adults

![Bar chart showing absolute loss among infants, children, and adults across three cemeteries.]

The three cemeteries had variable loss rates for infants. Alameda Stone and St. Benet Sherehog were similarly high: 80% and 90% loss respectively. The loss of infants at Voegtly Cemetery was a lesser 40%. Despite these different rates of loss between cemeteries, within each cemetery, the rate of loss was actually quite similar for infants, children, and adults. In the case of Alameda Stone, the loss of children was actually greater than either infants or adults. Although the loss of infants tended to be slightly higher than the loss of adults in all samples, it was never more than a difference of 13%. The inclusion of foetal remains slightly reduced the appearance of infant loss, save at St. Benet Sherehog where no foetal remains were enumerated.
DISCUSSION:

The three cemeteries in this study were quite demographically different from one another according to their burial records. At 21%, St. Benet Sherehog had the lowest infant mortality. From the records, it is also known that the adults in this population enjoyed the greatest chance of longevity, with many individuals surviving into their 70s and 80s. Age-specific infant deaths in the records clustered around birth, implicating congenital disorder or unsanitary birthing practices. San Agustin had the second greatest infant mortality. It was a relatively high 37%, even taking into account the fact that most who reached adulthood still died before achieving the age of 60. Of these deaths, more took place in early adulthood than was the case in the other cemeteries. This is possibly a reflection of the risks of frontier life. Unlike St. Benet Sherehog, the bulk of its infant deaths were clustered late in the second year of life, likely indicating weaning hazards and disease in Arizona’s hot climate.

Voegtly Cemetery had the highest infant mortality of all (52%). Childhood mortality in this sample was also higher than the other populations, while death among the geriatric category was proportionately reduced. Of the populations, Voegtly appears to be the least healthy from the demographic profile, with the fewest individuals surviving to adulthood. This may be a reflection of the industrializing conditions of the city at the time, which may have been particularly deleterious to infants and children as they lost caregivers to industry or entered into dangerous employment conditions themselves. Urban living conditions are also hazardous to the young, with poor sanitation, heightened exposure to epidemic diseases, and increased risk of respiratory ailments contributing to mortality. Infant mortality in this population may also be artificially inflated due to the high number of stillbirths in the parish records, compared to its contemporaries whose inclusion or exclusion of stillbirths is uncertain.

The comparatively few stillbirths recorded for Alameda Stone and St. Benet Sherehog may imply a) that fewer stillbirths occurred in these parishes b) stillbirths were buried/disposed of in some other way or c) those who were stillborn were included in the burial records and either intentionally or incidentally not recorded specifically as stillbirths. The former may have been a way of circumventing Anglican/Catholic doctrine that discouraged the burial of unbaptised infants in consecrated ground. The osteological evidence from all cemeteries would suggest that stillbirths were buried. This is also implied by other burial records from the time period which recorded family members providing lay baptisms for neonates whose death seemed imminent. The Hispano-american belief in “los angelitos”, small children whose purity assured that they would surpass purgatory and go directly to heaven, further substantiates these assertions (Heilen & Gray, 2010).
Comparison to Model West Life Tables resulted in plausible matches for the mortality profiles of each cemetery based on the available burial records. This indicates that mortality may vary greatly between populations and still be credible. Furthermore, the similarity of the excavated samples to the initial mortality profiles means that researchers may trust to a large extent the proportion of infant mortality represented by a thoroughly excavated burial population. Examining associated records can make researchers even more confident in this knowledge. This is especially true when probable causes behind age-specific death within a population are obvious from the records. Even within a population, high mortality in one age category may not correspond with overall high mortality. Alameda Stone is an example of this, with high infant mortality and a reasonable number of elderly adults. By contrast, high early life mortality in Voegtly Cemetery corresponded with earlier death among adults, with only around 10% surviving above the age of 60. The absolute loss of individuals in any given age group ranged between samples from 14-90%. Despite this, it was similar between age groups in any given cemetery. Losses to infants were slightly higher than adults, however only by 3 - 14%. In the case of the Voegtly cemetery, the loss of children was actually greater than the loss of infants. This seems to imply that where losses are high in one age category, they will be high in all.

There are several caveats to these promising results. The necessity of accurate and fairly precise aging for the entire population in excavated cemeteries is of paramount importance. Without the presence of this data, demography cannot be studied. Because cemeteries are often organized in sections, an incompletely excavated cemetery may also be skewed. It is important to study cemeteries which have had large percentages of their original burials cleared, or which at least involve a large sample size taken from different areas. Since there are a range of realistic mortalities, it is also important to consider each cemetery in context. One would not expect the mortality in a suspected plague pit or military cemetery to be perfectly average.

CONCLUSIONS:

Each group of cemetery records within this study demonstrated plausible infant (0 - 1.9-year-old) mortality rates as compared to Model West Life Tables. These ranged from 52% to 21%. Mortality estimates derived from the osteological evidence in this age category were consistently 5 - 10% lower than those obtained from burial records for the same cemetery. The absolute loss of individuals varied markedly between samples. However, it was found to be quite similar across age groups within each
cemetery, with attrition in the infant category only 3 - 14% greater than losses among adults. From this, we can conclude that the mortality profile of an excavated cemetery may fairly closely resemble the actual mortality profile of the cemetery. However, researchers should beware over-enumeration in early adulthood, and minor losses among juveniles. While the absolute loss of infants does appear to be slightly greater than that of adults, it is not excessively so. In some cases, the loss to children may actually be greater. A more persistent trend than loss in any one age category seems to be the overall similarities between infants, children, and adults in a given cemetery; where loss is fairly high in among one group, it appears to be high among all of them.

Works Cited


Chapter 8: Looking Forward to Look Back; How Investigations of Historical Burial Populations Can Inform Our Interpretations of Prehistoric Burial Practice

INTRODUCTION:

From the previous work, two important conclusions can be drawn. First, contrary to popular belief, the proportional loss of infants is not substantially greater than the loss of adults or children. This is a huge finding that essentially refutes the idea that infants inherently survive more poorly in the burial environment than adults. With this knowledge, it is possible not only to “trust” the mortality profile of infants in any future excavated burial grounds to a larger extent, but to go back and reinterpret previous excavations with the understanding that infants may not actually be absent. Rather, in a society that seems to exhibit lower infant mortality, low mortality is an actual possibility. Alternately, if infant mortality appears to be high, it should not solely be attributed to the assumption that the cemetery displays unusual preservation factors, but rather that it is reflective of mortality conditions specific to that community. This finding is bolstered by the observations of the variable mortality profiles in the archaeological samples, historical records, and the modern world.

In one of the samples, the loss to children was actually the greatest. This seems to parallel the work of Djuric and colleagues; although they did not draw the same conclusions overtly, close interpretation of their evidence seemed to substantiate the idea that in certain instances, children may fare worse in burial environments than infants (2011). Together, the loss of infants and children are slightly greater than that of adults overall. This suggests that something is resulting in their loss or lessened retrieval. As previously stated, the most common suspects are lower excavator recognition, intrinsic factors, or greater post-mortem disturbance, possibly resulting from shallower burial or smaller general bone size (Buckberry, 2000). It is possible that some or all of these factors, or factors unknown, may be minimally hastening their loss. Differential burial location in this instance cannot be implicated, because the mortality comparison is with burial records: whatever societal belief at the time, the number of infants listed is known to have been buried.

The other interesting finding revealed by the study is that the mortality profile of the population is more distorted by the osteological under-aging of older adults. This is not entirely surprising, as it is known that osteological ageing techniques become inherently unreliable after the age of around forty years (Buikstra & Ubelaker, 1994). However, when looking at mortality in archaeological populations, this research clearly shows that while infant and child mortality can generally be trusted, it cannot be
stated from an osteologically-derived mortality profile what average life expectancy was at birth, or whether individuals were surviving into what we consider to be “advanced” age (Chamberlain, 2006). Records illustrate to us that in populations such as St. Benet Sherehog, the elderly were present but are now invisible (Miles & White, 2008). In fact, it is the very elderly, not the young who can be said to be “missing” from archaeological populations!

As with sample size and the completeness of records, it is important to be mindful of the effect that migration has on population structure (Chamberlain, 2006). Such factors were clearly at play in Alameda Stone and Voegtly- both urbanizing communities- and at St. Benet Sherehog- a shrinking population. It is also crucial to consider the effects of the migration of the dead, as some of those who die within a community may be buried elsewhere, or reburied later. Because of these factors, careful consideration of records is always crucial.

Though these findings are quite interesting, their larger utility to archaeology in general has the potential to be limited in more ancient populations, for whom no comparative records exist. In such populations, it is more difficult to be certain that differential burial practices are not skewing mortality profiles in unpredictable ways. Taphonomy also may also be more capricious over a long period of time. While this study cannot hope to resolve such issues conclusively as far too many experiments are needed to resolve the conflicting factors, the application of the knowledge gained in the current research to older burial populations is one way to assess whether they display plausible or implausible mortality characteristics. This knowledge, in turn should help to refine the research questions which will one day answer which factors are more heavily implicated in loss to specific types of burial populations.

Similarities found in the study of ancient populations, likewise, can help to inform the small loss of infants and children that seems to be occurring in historic populations. If mortality profiles in one different type of burial environment are similar to historical burials (for example caves), then that may lead to the discovery of common factors responsible for their preservation, when compared to a second different burial environment (for example barrows) which displays an alternate mortality profile. The following paper attempts to address these issues.
Looking Forward to Look Back: How Investigations of Historical Burial Populations Can Inform Our Interpretations of Prehistoric Burial Practice

Amanda Murphy and Andrew Chamberlain, Faculty of Life Sciences, University of Manchester

This paper was presented at the Invisible Dead Conference, 2014. A version of this paper is undergoing publication in a monograph entitled The Invisible Dead: Proceedings of the 2014 Conference. Oxbow Books. Forthcoming.

ABSTRACT: In archaeological demography, it is often assumed that infant mortality was high in societies without modern fertility control, and that very high levels of infant mortality may have characterised prehistoric populations. It is also thought that infant remains are likely to be poorly preserved and less frequently recovered from archaeological contexts when compared to the remains of adults. Coupled with the early dates of most excavations, the small and fragmentary samples available have limited the opportunities for broad demographic studies of British Neolithic populations. The age structures from excavated historical cemeteries, when compared to burial records, may inform the understanding of true mortality rates in archaeological populations, as well as what percentage of the original burial population may be lost upon excavation. Two Post-Medieval excavated cemeteries (St. Benet Sherehog, London UK; and the Alameda Stone Cemetery, Tucson USA) were compared to corresponding parish burial records. The resulting discrepancies in early life mortality and recovery were then compared to the demographic profile of excavated Neolithic funerary contexts. The study of historic cemeteries suggests that taphonomic losses of infant remains are not universally more extensive than losses of adult remains. Despite this, infants are noticeably less frequently represented in the prehistoric assemblages.

Introduction

The study of ancient child mortality is essential to the comprehension of demographic processes in the past, as well as the understanding of prehistoric cultures. The fitness of a society’s offspring is one of the best indicators of its overall health and well-being (Meckel, 1990). From a bioanthropological perspective, the age at which children die can yield information about hygiene and medical practices during infancy; nutrition; parental investment; environmental hazards; and the seasonality and age distribution of certain epidemics (ibid.). On a more theoretical level, the number, sex, and status of children reared can be indicative of reproductive attitudes, economic niche, social stratification, the commoditization of children, and abstract behaviours such as gender preference in hereditary succession (Scott, 1999). In funerary contexts, the inclusion of children, or of specific children, can inform archaeologists about maturity, caste beliefs, and ritual (Waterman & Thomas, 2011).

Despite an increased interest in juveniles in archaeology in recent decades, the dearth of demographic data gathered during previous research continues to inhibit the study of children in past cultures. One persistent impediment is the assumption that infant and child mortality must have been “high” (Caldwell & Caldwell, 2003; Lewis & Gowland, 2007), even though excavations of burial sites
often yield “low” quantities of juvenile skeletal remains (Baker et al., 2005). This conundrum is compounded in studies of prehistoric populations, such as those of the British Neolithic. It is generally believed that life in that milieu was “nasty, brutish, and short”, characterised by near-catastrophic infant mortality, and acceptance of juvenile death as a harsh inevitability (Waterman & Thomas, 2011: 178). However, the more time that has elapsed between the present and the activity of the population studied, the more confounded archaeologists become by the possibility of taphonomic disruption (cf. Surovell et al., 2009) and non-normative burial practices (e.g. Parker Pearson et al., 2005). Notwithstanding the recondite nature of archaic cultures, the interaction between infant mortality, differential burial, and taphonomic factors has not yet been well-established even in more modern historically-documented populations, such as those of the Post-Medieval period.

Infant mortality is defined as the proportion of live-born infants who die in the first year of life. Currently, it ranges from as little as 0.2% in industrialized countries like Sweden, to values of over 20% in developing countries (Barbieri, 2001; Monnier, 2001; Matthews & MacDorman, 2007; Kuehn, 2008; DOI, 2012). Model life tables imply that populations with the lowest average life expectancy can experience infant mortality as high as 40% (Coale & Demeny, 1983; Caldwell, 1996). Other estimates for pre-transitional populations range from 15% to 30% and above (Hollingsworth, 1968; Buckberry, 2000). These inconsistent figures indicate that something is amiss with universally high estimates (Buckberry, 2000; Lewis & Gowland, 2007). Since the industrial revolution, infant mortality has declined in developing countries (Monnier, 2001). However, the perception that it transitions smoothly from “high” to “low” may be overly simplistic (Caldwell, 1976). In actuality, increases in infant mortality were observed during the industrial revolution in England and the US, with incidences varying in different parts of the country and different parts of the world (Newman, 1906; Meckel, 1990).

Researchers such as Djuric et al. (2011), Guy et al. (1997), Buckberry (2000) and Manifold (2013) have done preliminary studies into skeletal preservation as one factor that may affect estimates of an excavated population’s mortality. Without a better understanding of what the actual mortality was, however, such inquiries encounter a paradox wherein a low number of infants preserved is perceived to be demographically abnormal, and a high level of infants recovered is perceived to be taphonomically abnormal. Rather than being seen as an accurate reflection of mortality, this apparent under-representation of infants in mortuary assemblages has typically been attributed to differential burial practices, taphonomic factors, or incomplete sampling (Brothwell, 1972; Buckberry, 2000; Fazekas and Kosa, 1978; Scheuer and Black, 2000; Baker et al., 2005). In the Neolithic, these problems are multiplied. Not only is initial infant mortality unknown, but the sample sizes of excavated burial sites are
typically small, burial traditions are diverse and in some instances hypothesized, and a greater amount of time has elapsed since burial (Kinnes, 1975).

Another line of research has sought to compare the results of cemetery excavations with associated mortality derived from burial records, in order to assess the reliability of attrition estimates in particular populations (Lanphear, 1989; Saunders et al., 1995; Grauer & McNamara, 1995; Murphy, Forthcoming). The preliminary results from these studies have indicated that a substantial portion of the buried population may be present when excavation is thorough. By studying historic burial records, it is feasible to estimate the true mortality of the population which contributes the burials to a cemetery. Furthermore, it is possible to create a baseline approximating how many infants may be lost from a historic cemetery, predicated on use-history and taphonomic processes. This may be accomplished by comparing the divergence between recorded mortality figures and estimates calculated from the age distribution of excavated skeletons, in conjunction with spatial analysis of burial densities. Once such a baseline is established, it may be used for comparison with societies which presumably had even higher mortality, and were subject to prolonged taphonomic forces over hundreds and thousands of years.

Three central arguments continue to be invoked for discrepancies between expected levels of mortality and observed numbers of infants and children recovered in cemetery excavations:

1) Children were buried elsewhere (Brothwell, 1972; Buckberry, 2000).
2) The remains of children and infants were buried in the same place, but do not preserve as well as adult remains for intrinsic reasons (Fazekas and Kosa, 1978; Scheuer and Black, 2000; Baker et al., 2005).
3) Juvenile skeletons are more likely to be overlooked by excavators because of disturbance, incomplete sampling, or inability to recognize them (Buckberry, 2000; Lewis & Gowlan, 2007).

The argument that children were buried elsewhere is often inadequate as an explanation for a deficit of children in the mortality profile. If separate child cemeteries or portions of cemeteries were typical, and the population under study had high levels of child mortality, one would expect to encounter child cemeteries with comparable frequency to adult cemeteries. In the historic period, the unceremonious disposal of children is simply not consistent with Christian attitudes about the resurrection of the body, nor the Beautification of Death movement, which emphasized the social pride taken in providing a decent burial for ones' family (Heilen & Gray (eds.), 2010). There are some regions and time periods when the segregation of child burials was practiced (e.g. the cillini cemeteries reserved for the burial of
children in early historic Ireland – Finlay, 2000) but inclusion of children within cemeteries of all ages and both sexes was the norm in historic Europe.

In Neolithic populations, the issue of burials in separate locations is a more difficult question. It is possible that child burials were generally erratically placed and highly dispersed, therefore evading archaeological detection because of their small size and isolation compared to more conspicuous monumental burial places (Brothwell, 1972; Kinnes, 1975). However, one of the features of the Neolithic transition is regarded as the collectivisation of burial (Waterman & Thomas, 2011). In most excavated Neolithic interments, at least some pre-adult remains are included. Of the sixteen samples utilized in this study, only three lacked infants entirely, while all had children under the age of ten years. Clearly inter-age burial was by no means proscribed. On the other hand, some chambered tombs, such as Notgrove, Point of Cott, and Thickthorn Down included an unusually high proportion of infants compared to a small absolute number of adults (Drew & Piggott, 1936; Barber, 1997; Smith & Brickley, 2009). This may indicate that certain places were more favourable for infant burials.

The second claim, namely, that juvenile bone does not preserve as well as adult bone is also losing credence. In taphonomic studies, immature bone tends to be similarly preserved to adult bone, and the elements present do not differ substantially between adult and child remains (Djuric et al., 2011; Lewis & Gowland, 2007). This would imply that if infant bone typically disintegrates faster than adult bone, it does so suddenly and completely upon reaching some unknown threshold (Guy et al., 1997). If this were the case, the detection of numerous empty, infant-sized grave cuts would be anticipated during the excavation of inhumations. So far, this has not been attested by archaeological evidence. Similarly, if infant bone is intrinsically weaker than adult, its survival relative to adult bone should become rarer the farther into the past one looks. In addition, its preservation ought to be comparatively poor. The presence and occasional prevalence of infant bone in Neolithic contexts clearly argues against this. In Neolithic populations, especially in single interments, children may even be found to be in very good condition (Mercer & Healy, 2008; Harris, 2010).

The third argument, the failure to identify infant burials, is gaining credibility. It is acknowledged that sub-adults have often been disregarded in historical excavations; the retrieval of child and infant remains has increased in recent decades in tandem with improved osteological techniques (Buckberry, 2000). While post-medieval cemetery excavations have only recently gained popularity, Neolithic burials have been of archaeological interest since the late 1800s (Renfrew, 1979; Hedges, 1984). Kinnes (1975) studied the demographic structure of skeletal remains from 53 Neolithic non-megalithic long barrows. He concluded that the ratio of adults to children was 181:51, with many tombs including no children at
all. Although this imbalance is frequently attributed to age-status burial practices, it is unknown whether infants in these excavations were simply “missed”. To their credit, many of the early excavations, such as those included in this study, took care to identify pre-adult remains (Renfrew, 1979; Hedges, 1984; Mercer & Healy, 2008). However even in these, the techniques used for the calculation of minimum number of individuals in commingled assemblages and osteological aging were often too inchoate for gathering precise data. Fortunately, a great deal of osteological reanalysis of the remains from Neolithic tombs is currently taking place, yielding more reliable age estimates (Smith & Brickley, 2006; Whittle et al., 1999; Whittle & Wysocki, 2007; see also Silva, 2003 for similar research on Portuguese Neolithic tombs).

A related confounding element is the extrinsic taphonomy of burials, including reuse and abandonment of the burial ground. Studies have also indicated that the shallower depth of infant interments in historic cemeteries may lead to increased likelihood of disturbance and pre-exavation destruction of their graves (Buckberry, 2000). In such cases where remnants of disturbed infant burials exist, they may not be recognized, especially when disarticulated. During the Neolithic, the added dimension of secondary burial practices (such as excarnation) might result in the loss of tiny infant bones, as they were manipulated and moved about in the tombs (Thomas, 2000). The proportion of children’s remains has been found to be high in causewayed enclosure burials compared to those placed in long barrows (Thorpe, 1984), and articulated child burials therein have also been observed to exhibit good preservation (Harris, 2010). While this might indicate a different series of burial practices that included more children, it might equally suggest that preservation and retrieval are simply better with bones that are buried in ditch deposits and are hence more likely to remain in situ. Taken together with the varying extent of bone recovery during cemetery excavation, it is perhaps not surprising that estimates of infant and child mortality appear to be so variable.

In light of improved aging data for British Neolithic skeletal assemblages, and emerging studies of archaeological mortality estimates, it is possible to attempt to address some of these issues. This study aims to compare estimates of infant mortality in excavated historical cemeteries with corresponding burial register data, in order to gain an understanding of the reliability of estimate based on skeletal remains, and the collation of infant mortality data from a range of British Neolithic mortuary contexts.

**Methods**

Two excavated post-medieval cemeteries were studied along with their corresponding parish burial records, as part of a wider study of infant representation in historical period cemeteries (Murphy,
forthcoming). These sites were St. Benet Sherehog (SBS), London, England, in use from 1670-1850; and Alameda Stone (AS), Tucson, Arizona, USA, in use from 1851-1875 (Miles & White, 2008; Heilen & Gray, 2010). 1,867 burials recorded between the years of 1716-1849 from the combined London parishes of St. Benet Sherehog and St. Stephen Walbrook were compared with the age-at-death structure of 230 skeletons excavated from the churchyard of SBS, excavated from 1994-1996 (Bannerman & Bannerman, 1920; Miles & White, 2008). 5,099 burial records (ca. 1875-1909) from the Tucson parish of San Agustin were compared with the 1,166 burials excavated from the associated Alameda Stone cemetery from 2006-2008 (Heilen & Gray, 2010; Thiel, 2012).

The ages at death were aggregated into six age categories to facilitate comparison between historical and anthropological data: 0-1.9 years (infants and young children), 2-11.9 years (older children), 12-17.9 years (adolescents), 18-34.9 years, 35-49.9 years and 50-99.9 years (young, middle and old adults respectively). These categories were selected because they corresponded with the most discernible age groups utilized in published reports on the osteological samples. The percentage of deaths in each age category from the burial records was compared to the percentage of deaths in each age category in the excavated osteological assemblage. The resulting deficit between the osteological sample and the records was then examined for patterns within and between the two populations. Possible trends were noted for comparison with Neolithic populations.

The British Neolithic samples consisted of eleven chambered tombs, two regional groups of caves with Neolithic burials, and three causewayed enclosure sites. These sites were chosen because the reports used sufficiently precise age categories (including subdivisions of the pre-adult category), which facilitated a comparison of infant mortality amongst the populations. The sites included are presented in Table 1.

The chambered tombs and long barrows/cairns include stalled cairns from the Orkney Isles, and long barrows and cairns, the majority of which are from the Cotswold-Severn group. The stalled cairns comprised a large enough sample to allow separate examination. While it was initially hoped that more causewayed enclosures could be included, the lack of precise age estimates for skeletal remains limited the sample to three sites (Curwen, 1934; Whittle et al., 1999; Mercer & Healy, 2008). The White Peak cave system group was aggregated from a recent osteological re-analysis of human remains from fifteen caves with Neolithic direct dates (Papakonstantinou, 2009). The North Yorkshire cave group included four caves in the North Yorkshire Moors, and fourteen caves in the Yorkshire Dales (Leach, 2006). Most of the tombs and causewayed enclosure sites were excavated at early dates, ranging from the mid-1800s
Table 1: British Neolithic Sites Utilized

<table>
<thead>
<tr>
<th>Sites</th>
<th>Excavation Date</th>
<th>MNI</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHAMBERED TOMBS AND LONG BARROWS/CAIRNS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickthorn Down Long Barrow</td>
<td>1936</td>
<td>5</td>
<td>Drew &amp; Piggott, 1936</td>
</tr>
<tr>
<td>Notgrove Long Barrow</td>
<td>1881</td>
<td>10</td>
<td>Smith &amp; Brickley, 2006</td>
</tr>
<tr>
<td>Sale’s Lot Long Barrow</td>
<td>1936</td>
<td>21</td>
<td>O’Neil, 1966</td>
</tr>
<tr>
<td>Whittwell Long Cairn</td>
<td>1988</td>
<td>16</td>
<td>Vyner, 2011</td>
</tr>
<tr>
<td>Parc Le Bres Cwm Long Cairn</td>
<td>1870</td>
<td>35</td>
<td>Whittle &amp; Wysocki, 1998</td>
</tr>
<tr>
<td>Isbister Stalled Cairn</td>
<td>1958-1975</td>
<td>342</td>
<td>Hedges, 1984</td>
</tr>
<tr>
<td>Quanterness Stalled Cairn</td>
<td>1972-1974</td>
<td>157</td>
<td>Renfrew, 1979</td>
</tr>
<tr>
<td>Point of Cott Stalled Cairn</td>
<td>1984</td>
<td>13</td>
<td>Barber, 1997</td>
</tr>
<tr>
<td><strong>Chambered Tombs Total MNI</strong></td>
<td></td>
<td>728</td>
<td></td>
</tr>
<tr>
<td><strong>CAUSEWAYED ENCLOSURES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Whitehawk Camp</strong></td>
<td>1929, 1932-1933, 1935</td>
<td>8</td>
<td>Curwen, 1934</td>
</tr>
<tr>
<td><strong>Windmill Hill</strong></td>
<td>1922-23, 1925-29, 1957-58, 1990</td>
<td>6</td>
<td>Whittle <em>et al.</em>, 1999</td>
</tr>
<tr>
<td><strong>Hambledon Hill</strong></td>
<td>1974-1986</td>
<td>77</td>
<td>Mercer &amp; Healy, 2008</td>
</tr>
<tr>
<td><strong>Causeway Enclosures Total MNI</strong></td>
<td></td>
<td>91</td>
<td></td>
</tr>
<tr>
<td><strong>CAVE GROUPS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>White Peak</strong> (Derbyshire/Staffordshire)</td>
<td>1870 - 2009</td>
<td>110</td>
<td>Papakonstantinou, 2009</td>
</tr>
<tr>
<td><strong>North Yorkshire</strong></td>
<td>1860 - 1985</td>
<td>76</td>
<td>Leach, 2006</td>
</tr>
<tr>
<td><strong>Cave Systems Total MNI</strong></td>
<td></td>
<td>186</td>
<td></td>
</tr>
</tbody>
</table>

to the late 1900s, however several skeletal assemblages have been re-analysed using more modern osteological methods (Smith & Brickley, 2006; Whittle *et al.*, 1999; Whittle & Wysocki, 2007). All of the osteological assemblages from the cave sites were analysed recently, though some of the remains were recovered from early excavations.

**Results**

The first stage of the analysis involved the study of two historic cemeteries. Mortality for the osteological samples and burial records for SBS and AS, compared to plausible model life table mortality estimates, are presented in Figures 1-2. These profiles tell the stories of two different populations. From the burial records, infant/young child mortality is much lower in SBS (21%) than in AS (37%). Though the value for SBS is relatively low, both infant/young child mortality figures are plausible as realistic
infant mortality estimates for the historical period, and demonstrate how urban populations may vary
during one time period. The mortality pattern at SBS can be approximated by mortality in a West model
Level 9 stable female population with average life expectancy at birth ($e_0$) of 40 years and annual growth
rate ($r$) of 0.5%, whereas AS resembles a Level 5 stable female population with $e_0 = 30$ years and $r =
0.5%$. (Coale and Demeny, 1983).

Comparing the estimates of mortality from the burial records and the osteological samples, a
deficit of 5-7% in the osteological mortality (as a proportion of total mortality) was observed in the
youngest (infant/young child) age category for both populations. There was no apparent deficit in the
osteological data for older children in the SBS population, but a small deficit in the osteological
representation of older children was observed in the AS population. While these results should be
interpreted with caution until they can be tested against more populations, this would imply that the loss
of infants and young children due to intrinsic factors may not be as severe as has previously been
implied. The osteological mortality profiles for both populations exhibit the excess of young adults and
deficit of old adults that are widely observed in palaeodemographic datasets. This apparent distortion of
the adult osteological mortality profile may be explained as systematic biases in the estimation of adult
age at death (Chamberlain, 2006).

The second stage of analysis involved the examination of the Neolithic burial datasets. Although
many Neolithic tombs and burials have been excavated, few reports have employed sufficiently precise
aging data to allow modelling of age-specific mortality (Mercer & Healy, 2008). A preliminary
comparison was made between pre-adults (usually defined as < 17 years of age at death) and adults
utilising data from previous reviews of the osteological evidence (Kinnes, 1975; Marsden, 1977; Thorpe,
1984; Barnatt & Collis, 1996; Barnatt & Edmonds, 2002; Smith & Brickley, 2009). These sources,
collected by various authors, use slightly varying section points to separate the pre-adult and adult
categories but as the adolescent age category normally has the lowest age-specific mortality the effects of
these differences in methods are minimal. The results are presented in Figure 3.

Overall, pre-adults are moderately well-represented (19-45% across all samples). However, as a
proportion of barrow and burial mound samples pre-adults are under-represented compared to their
proportions in caves and causewayed enclosure. In order to study infant mortality in greater detail, two
regional cave groups, eleven long barrows and cairns, and three causewayed enclosures with more
precise aging data were analyzed separately and then as aggregates. Figure 4 shows the mortality profile
within the North Yorkshire and White Peak regional cave groups (Leach, 2006; Papakonstantinou,
2009), as well as the data from the causewayed enclosure sites of Hambledon Hill (Mercer & Healy,
Figures 1 & 2: Mortality from the St. Benet Sherehog and St. Stephens Walbrook Burial Records & St. Benet Sherehog Osteological Sample Compared to Level 9 Model Life Table Data (Top); Mortality from the St. Agustin Burial Records & Alameda Stone Osteological Sample Compared to Level 5 Model Life Table Data (Bottom)
Figure 3: Aggregated Comparison of Sub-adult (<17 Years) to Adult (>17 Years) Mortality from Various Neolithic Sources

![Graph showing mortality comparison between sub-adult and adult groups from different Neolithic sources.]

Sources: Neolithic/Early Bronze Age Burials in Peak District Caves (Barnatt & Edmonds, 2002); Wessex Causewayed Enclosure Burials (Thorpe, 1984); Burial Mounds of Derbyshire (Marsden, 1977); Wessex Long Barrows (Thorpe, 1984); Neolithic Long Barrows (Smith & Brickley, 2009); Non-megalithic Long Barrows (Kinnes, 1975).

2008), Whitehawk Camp (Curwen, 1934) and Windmill Hill (Whittle et al., 1999). The White Peak cave sample showed an infant/young child mortality of 23%, followed by a slight rise in later childhood and an expected drop in adolescence. The mortality profile in this cave group resembles a high mortality model life table with some under-representation of individuals in the infant age category. The mortality profile for the North Yorkshire Caves Group exhibits much lower infant and child mortality with correspondingly higher proportions of individuals in the adolescent and adult categories. Although taphonomic factors might account for the differences between the cave burial groups, they may also be attributable to intentional age and/or status-based burial practices. Like the Yorkshire Caves, infant/young child remains were also under-represented at Hambledon Hill (8%). However, the remainder of its mortality profile more closely resembled the White Peaks Caves. Overall, the data presented in Figure 4 confirms the presence of high proportions of pre-adults in cave and causewayed enclosure.
The barrow burials were sufficiently numerous to be subdivided into a stalled cairn group, and a long barrow group. The percentage of deaths by age category in the stalled cairns is presented in Figure 5. The stalled cairns included the largest single samples in the entire study, with the Isbister population including an MNI of 342 individuals, and Quanterness including 157 (Hedges, 1984; Renfrew, 1979). The sample from the Point of Cott cairn was unfortunately much smaller, with only 13 individuals represented (Barber, 1997). Although a small sample, Point of Cott had an unusually high proportion of infants.

Isbister and Quanterness display relatively normal profiles for all age categories but the first. Together these two samples most clearly illustrate the deficiency of infants and young children, with 6% and 7% respectively. There is also a lesser discrepancy in these groups between the 3-11 and 12-17-year-old population.
old age categories than in some other groups. This may suggest age-dependent burial practices, with infants intentionally excluded. Alternately, the infant deficiency in this large population may be due to

Figure 5: Percent Deaths by Age Category from Three Excavated Stalled Cairns. (Hedges, 1984; Renfrew, 1979; Barber, 1997)

less recent osteological analysis than populations such as Hambledon Hill and the Cave Systems.

Eight long barrows and cairns were available for study, ranging in sample size from 5 individuals to 49 (Figure 6). Half of these tombs include very few individuals in the 0-2-year age category (Whitwell Cairn, Parc le Breos Cwm, Ascott Under Wychwood, and West Kennet). Despite the near absence of infants and young children, the proportion of older children (3-11-year age category) ranges from 12-25% in these samples, implying that something other than age/status alone determined their burial.

The remaining tombs appear to have had moderately high numbers of infants and young children (14-30%). Notgrove, though only a sample of ten burials, also includes some individuals of all ages, in addition to a high proportion of infants (30%). It displays a similar mortality profile to the Point of Cott stalled cairn. This may suggest that smaller tombs were more likely to include infants. The percentage of 3-11 year olds is 10-27% in all populations. In most groups, this is higher than 0-2 year olds, and
considerably higher than the proportion of individuals in the 12-17-year-old age group. In the four largest populations, the 12-17-year-old group is negligibly represented at 2% (Hazleton North), 3% (West Kennet), 6% (Parc le Breos Cwm), and 6% (Ascott Under Wychwood). This continuing trend, observed in most Neolithic groups studied, seems to imply that children were buried in large percentages and preserve acceptably. To attempt to mitigate the effects of small sample size, the sites were aggregated into Causewayed Enclosures, Cave Systems, and Chambered Tombs (Figure 7). When aggregated, both causewayed enclosures and chambered tombs show 8% of their populations in the 0-2-year age group. This figure is considerably lower than would be expected for a historical period population, even accounting for some bone loss. The aggregated cave samples exhibit 17% in the infant/young child category. While this likely represents minor taphonomic loss, it is a proportion that is only a little lower than expected values for historical period mortality. This may imply that cave burial sites included more infants than chambered tombs and causewayed enclosures initially, that infant burials were less disturbed in caves, or some combination of both. All groups show ~20-30% mortality in the 3-11-year
group. This is markedly higher proportional mortality than in historical-period populations, though perhaps partially accounted for if infants and young children are under-represented in the Neolithic assemblages. This may imply either that mortality in that category was unusually high, or that children of that age were especially likely to be represented in burial contexts.

**Discussion**

The burial records for the two historic cemeteries in the study exhibited plausible infant/young child mortality figures: 19% and 37% of total mortality occurred in the 0-1.9-year category, respectively. Mortality estimates from osteological data were 5-7% lower for the youngest age category for both populations. If the lower infant/young child proportions in the osteological samples were entirely attributable to post-depositional (i.e., taphonomic) loss then these data imply a loss of 20 - 40% of the youngest age category (assuming no taphonomic loss of other age categories). The data are consistent with hypothesised preservation and/or recovery factors that differentially impact on the skeletal remains of infants, whereas deficits in the osteological profile for older children were less marked. These findings have three implications. 1) Infant/young child mortality may not always be uniformly “high” in pre-
transition populations, but may have varied markedly (in the historical samples in this study infant mortality varied by a factor of two). 2) The differential loss of infant and young children’s bones from the initial burial population appears to be moderate and in the historical populations sampled could be accounted for. 3) Under-representation of children in excavated skeletal samples is likely to be more substantial for the youngest age category in the Neolithc.

Though both Alameda Stone and St. Benet Sherehog were situated in urban centres, living conditions, climate and occupation were likely quite different. Alameda Stone was a desert frontier community, which was characterized as unsanitary and rough (Heilen & Gray, 2010). During the use-period of the cemetery its population was sizable and expanding. Despite this, it lacked the heavy industrial atmospheric pollution and overcrowding of London. St. Benet Sherehog, although a large parish, had only around 230 parishioners at its height, and was experiencing a gradual population decline during the cemetery’s period of use (Miles & White, 2008). Alameda Stone exhibits high early life mortality, with the greatest percentage of infant deaths clustered around the ages of 1-2 years. This implies high fatality around weaning-age, probably due to the gastrointestinal diseases that would have flourished in Arizona’s hot, dry climate (Heilen & Gray, 2010). St. Benet Sherehog had a reduced level of infant mortality, owing to the greater proportion of deaths among its elderly. Its infant attrition was clustered in the neonatal period, suggesting unsanitary birthing practices or congenital enfeeblement, such as might be attributed to maternal alcoholism and stress. The geriatric population of Alameda Stone was younger on average than that of St. Benet Sherehog, whose parishioners frequently survived into their eighties and nineties. This may be due to the frequency of occupational accident and/or increased frailty of the elderly associated with frontier living.

In early adulthood, the age categories tended to experience a surplus in the osteological sample compared to the burial records. This is due, largely in part, to the difficulty in determining precise osteological ages for adults above the age of 40 (Chamberlain, 2006). The result is an over-enumeration of skeletal adults in the 18-49.9 year categories, and a deficit in the 50-99.9 year categories. It is also possible that this is part of the explanation for over-enumeration in the 12-17.9-year category in the osteological profile at SBS. The burial records, by contrast, attest that in both populations many individuals survived well above their fifties with up to one third of mortality occurring in the oldest adult age category. A major deficit of more than 50% of expected values is seen in the osteological estimate for 50+ mortality at St. Benet Sherehog. This is particularly interesting in light of the typical belief that few people lived to advanced age in the European Neolithic (cf. Fahlander, 2013): it would suggest that
the adult ages derived from an osteological population are inherently unreliable notwithstanding the appearance of few individuals with advanced osteological age estimates.

Although issues of incomplete or faulty recording may create inaccuracies, a fairly complete burial record can be reasonably assumed to provide an accurate initial mortality estimate. In the case of SBS, the burial records were shared between two parishes, though only one cemetery was examined (Miles & White, 2008). At AS, the parish burial records were coming into use around the time the cemetery was falling into disuse. As such, records will not be perfect correlates, however they are both reasonably consistent. For example, when recording of burials became mandatory in London following the Act of Parliament for Laying a Duty on all Burials 1783, neither the composition of the burial register at SBS nor the rate at which burials were recorded changed substantially from the previous years (Bannerman & Bannerman, 1920). The parish of San Agustin was the main parish for the entire population of Tucson, both during the use period of the cemetery and after (Heilen & Gray, 2010; Thiel, 2012). Furthermore, the use period of the cemetery, and the duration of the records form a relatively discrete time period (around 60 years). Though mortality may have changed during this time, it is probably reasonable to assume that any changes would not have been substantial.

An initial look at Neolithic populations subdivided into Pre-adult (<17 years) and Adult (>17 years) age categories yielded markedly varying proportions of subadults (19-63%). When broken down into more precise age categories, however, it becomes clear that within individual burial loci, infants and young children are typically under-represented. Regional groups of cave burials, causewayed enclosures, and tombs typically included ~5% to no more than 20% in the youngest age group. There were some exceptions to this, including the anomalous White Peak regional cave group. At the same time, some populations had an unexpectedly large proportion of individuals in the 3-11-year age group. This is interesting in light of the prevailing belief that tomb inclusion was ancestor-based (Thomas, 2000); if so, those without direct descendants apparently could be integrated into the burial system. In modern populations, mortality typically drops markedly after early childhood as individuals become more resistant to infection and build greater nutritional reserves. As Neolithic populations were likely too small and dispersed to sustain major epidemic diseases, it is possible that fatal accident was more important as a cause of death, and this would be a risk that was more evenly distributed across age categories. Another possibility is that the “missing” infants are artificially inflating the appearance of the 3-11 age group. In order to create “normal” mortalities for all populations, in which the number of 0-2 year olds exceeded the number of 3-11 year olds at around 30%, the number of infants within the cave
systems would need to double, while the number of infants within the tombs and causeway enclosures would need to quintuple.

Three main types of mortality profiles were observed: 1) Excessive deaths in childhood 2) Small but normative “family-like” samples and 3) Linear, status/age-preferential samples. Most of the larger populations, including the aggregated samples, displayed an anomalously high level of mortality in the 3-11-year-old group, even where the proportion of infants/young children is high enough to be reasonable. Notgrove and Point of Cott, two of the smaller samples, demonstrated relatively normative mortality profiles. This could indicate that these were drawn from smaller, more inclusive groups. Finally, the Yorkshire Cave group, Isbister, and Quanterness in particular display linearly increasing mortality profiles that may indicate age/status preferential burial. These samples, though large and well-preserved overall, appear to lack infants and young children, while favouring adults.

When aggregated, the regional cave groups resulted in the most normative mortality profile, although the number of 3-11 year olds was still high. Chambered tombs were the second most normal, with infants underrepresented. Causewayed enclosures were the most irregular, with infants lacking, and the highest spike in the 3-11-year age group. This may be due in part to the small number and sample sizes of causewayed enclosures available for study.

Conclusions

Despite the fact that sub-adults are not severely under-represented in some Neolithic populations, the percentages of mortality in the youngest age category of aggregated populations are too low to be a realistic representation of infant mortality at the time. At the same time, some smaller individual tombs demonstrate more complete mortality profiles, making it evident that not only were infants initially included in some cases, they were preserved enough to be recoverable during archaeological excavation. Larger tombs, while often containing some children, may have experienced their loss through post-mortem manipulation, poor retrieval during excavation, or low initial inclusion.

Aggregated cave systems demonstrate the most plausible mortality profile, with an overall infant/young child mortality of 17%, a rise in early childhood, a drop in late childhood, and a high proportion of deaths in the adult group. However, when separated into regional cave groups marked differences are observed between Derbyshire/Staffordshire and Yorkshire in the proportions of infants and children. This indicates that cave burial customs may have differed between the regions, as they apparently did between categories of tombs. Both causewayed enclosures and chambered tombs display a deficit of infants which far exceeds the 5-6% disparity between burial records and osteological data.
observed in excavated historic cemetery populations. Despite this, the fact that infants are present at all in the Neolithic implies that the 5-6% deficit recorded in populations from 300 years in the past cannot be extrapolated as a regular rate of loss: a greater deficit in the Neolithic might be expected if it were. The fact that mortality in the 3-11-year group is rather high in the same populations (19-29%) also indicates that their mortality profiles are not solely explicable in terms of taphonomic loss, unless the misplacement of small neonatal bones can be postulated. Even where infants are well represented, mortality typically rises among older children during the Neolithic; a feature which is uncharacteristic of modern mortality. This may imply high risk of accident, which is a common cause of fatality among young children in difficult environments. It may also imply that four-fifths of the original infants within the causeway and tomb populations are missing, while one-half of the original number of infants in cave systems are missing.

Works Cited


Chapter 9: Limbo; The Surprising Void Between the Question and the Answer.

“Ivan never crossed the cemetery to get to his lonely shack on the other side. That path would save many minutes, but he had never taken it not even in the full light of noon.”
- “The Path Through the Cemetery” by Leonard Q. Ross

As expected, the application of osteologically derived historical mortality information to ancient cultures had mixed results. While few ancient sites mimicked mortality that fell in one of the experimentally-derived ranges, notably, several did. This suggests that in these more ancient populations, infants are often underrepresented, but that does not mean that they were not initially included to some extent. It is possible to observe, for example, that certain ancient sites seem to have fairly good preservation of individuals in all age categories. Therefore, it cannot reasonably be argued that the skeletons of infants and children simply do not survive over a longer period of time.

Causewayed enclosures, which practice interments, have good preservation of infants and children (Whittle et al., 1999). Sites like long-barrows and caves have highly variable inclusion, ranging from quite good to notably absent (Hedges, 1984, Saville, 1990; Barber, 1997; Vyner, 2011). While it is possible that some of these sites in non-uniform cultures practiced infant exclusion/alternate burial, the common denominator seems to be lack of taphonomic stability and excavator techniques. Presumably, burials, which are something of a closed system, underwent less disturbance than many caves, which may be subject to various natural processes and possible human disturbance simply by virtue of their accessibility and exposure.

Barrows, while often closed, are believed to have been subject to extensive human manipulation in their use-period (Thomas, 2000). Notably, it was many of the smaller “family size” barrows and cairns such as Point of Cott, Whitwell, and Hazelton North, which contained higher and more realistic proportions of infants (Saville, 1990; Barber, 1997; Vyner, 2011). This may imply that lack of disturbance (i.e. less intentional manipulation of remains) lead to better preservation of all age groups, as these burial places were presumably entered and rearranged fewer times than the larger and longer-used tombs like Isbister (Hedges, 1984). Additionally, poor excavator technique is almost certainly a factor influencing preservation at these nexuses of antiquarianism. Bahn relates a number of anecdotes from early barrow excavations including throwing human bone to see how far it could go without breaking, and an overseer beating one of his workmen with a femur (1984). Notably, the more recent analysis of bones from prehistoric sites has improved the reporting on juveniles (Whittle & Wysocki, 2007;
Waterman & Thomas, 2011). These factors suggest that a combination of poor retrieval and actual physical “loss” of remains in open burial environments is implicated over disproportionate dissolution of infant remains owing to internal factors.

Though loss to the younger age categories in historic cemetery excavations was fairly low, something must still account for the discrepancy. Buckberry has demonstrated in medieval populations that shallower depth of juvenile burial was one factors accounting for poorer preservation (2000). In all probability, infants are typically buried at shallower depths in most interments simply because of the difficulties inherent to digging a hole which is both narrow and deep. It would be interesting to study relative infant preservation in mass burial pits for this reason. In historic environments, it seems likely that shallow burials would be subject to greater disturbance than average through the frequent overbuilding and digging to which such sites are subject (Baugher & Veit, 2014; Boyle, 2015). The inability of individuals to recognize those remains could then lead to their destruction without the realization that a cemetery is present. This also holds true of the machine excavation of many historical archaeological sites (King, 2005): even where professionals are present it is much easier to inadvertently destroy a small infant grave without realizing it than an adult grave when careless methodology or heavy machinery is being used (Baker et al., 2005).

It was hoped that an actual study of burial depth by age could be included as part of this research to substantiate Buckberry’s observations on preservation by age (2000), and move towards a better understanding of processes in the burial environment itself. Unfortunately, like much data, preservation and burial depth by specific age was not often presented in historic cemetery reports. This was not the only omission. In many reports, no depth data was included at all. As noted at the start of this study, the lack of precise osteological age categories in reports was immediately apparent. In rare cases where preservation is very poor, it is not possible to determine this information (Buikstra & Ubelaker, 1994). However, in most instances, at least general age categories should be describable if it is permitted by the excavators (ibid.). While age and other demographic factors may be unclear in complex, intercutting burials, osteological technique still allows for the calculation of the minimum numbers of individuals within age categories to a certain extent (ibid.; Adams & Byrd (eds.), 2008). Even where osteological information is absent, it has been demonstrated that coffin sizes are a reasonable proxy of fairly precise age, as well as indicating the more general categories of adults, children, and infants (Ubelaker & Jones, 2003). This may also prove to be true to a lesser extent of grave shaft size. Unfortunately coffin and precise grave shaft measurements were even rarer than grave depth. This was especially true for vaulted graves which have a secondary chamber closer to the original coffin size.
As discussed with the introduction to taphonomy, the preservation scoring systems in place (Brickley & McKinley, 2004), resulted in interpretations which were so different as to be incomparable. Often, it would be evident from photos that what constituted “good” preservation at one site was considerably different from “good” preservation at another. Without the ability to make rapid determinations of bone density etc., preservation is a somewhat subjective category (ibid.; Buikstra & Ubelaker, 1994), however a more replicable metric would be an excellent addition to the field. Studies of soil acidity or hydrology relatively to preservation were virtually non-existent in US reports. Even the type of precision recording to study taphonomic processes that Duday has modelled is almost never replicated (2006, 2009). This is ironic considering that his process essentially consists of producing accurate feature drawings (ibid.), which are meant to be a staple of any archaeological excavation (Renfrew & Bahn, 2012).

A very small number of cemetery reports included the actual burial records or investigations thereof which could be compared with osteological age estimates (e.g. Miles & White, 2008; Heilen & Grey, 2010 a-e). It is a fairly basic and central goal of any study of a large buried population to consider the demographic make-up of the group (Chamberlain, 2006), so it is surprising that this information rarely seems to be sought out let alone analysed. For later researchers who are not local to the area of excavation, and therefore often lack access to any associated parish records, even a simple statement of whether such records exist and if so, where they are kept and what their quality may be is incredibly useful.

Although analysis and summaries of factors surrounding osteology, records, and material culture is desirable for the readability of any publication (Buikstra & Ubelaker, 1994), the inclusion of the raw data as appendices or in online repositories is what makes the project truly useful. In this way, research regarding the specific site and larger archaeological questions are able to be continually expanded upon. The Museum of London in particular has done an exemplary job of making their data accessible through engaging publications and an online repository (http://archive.museumoflondon.org.uk/Centre-for-Human-Bioarchaeology/). Oxford Archaeology, though not presenting raw data, makes their excavation reports widely available via their website (https://library.thehumanjourney.net). A few exemplary reports such as those surrounding the famous African Burying Ground reports are also available online (Blakey & Rankin Hill, 2009). In the current age, the presentation of information this way is considerably easier than traditional publication. While it can clearly be argued that the current study could have benefitted from the inclusion of osteological ages and more precise measurements in reports, the great irony is that it should not be necessary to advocate for the inclusion of data resulting from the application of basic
archaeological technique in the modern day and age. Legal requirements in the UK demand “preservation by record” whenever archaeological work is required (White, 2011; Mays et al., 2015). In the United States, though the legal requirements for the relocation of cemeteries vary, archaeological projects in general are compelled to employ professional archaeologists as standardized by the Register of Professional Archaeologists (2016; Ubelaker, 2011). Generally obliged to have an archaeological degree and a field school under their belt, such professionals are aware of archaeological method (Renfrew & Bahn, 2012). As described in the introduction, archaeological methodology developed with the understanding that each excavation must be treated as an experiment in itself: careful and precise recording of archaeological sites is the only way to remedy the destruction that results from excavation and ensure that the project is remotely scientific (ibid.; Buikstra & Ubelaker, 1994). Although not all measurements are uniformly standardized, taking three-dimensional measurements of features, such as graves, and recording at least a sampling of objects and human remains in such a way that they can be studied is not “optional”. At some point, failure to take such measurements simply becomes desecrating burials for (meagre) profit.

Because of this, the variable reporting witnessed in so many excavation reports was fairly surprising. The result often seemed to be better in publications of UK excavations, where there was a clearer legal obligation and divide between the archaeological requirements for watching briefs and full excavations (Mays et al., 2015). In American reports, there seemed to be a greater level of unpredictability. Indeed, different levels of recording are required depending upon whether a project simply calls for the monitoring of burial removal- that is, archaeologists essentially watching contractors mechanically excavate a site, perhaps recording some aspect of the findings, and making sure undue damage is not done (King, 2005). The fact that some projects resulted in only monitoring when hundreds of burials and seemingly unique artifacts were present was itself a disappointment and a curiosity. Unfortunately, the factors that lead to the decision of whether the project was to be an excavation or monitoring project were often undiscussed. The reasons giving rise to this state of affairs in itself it a worthwhile debate.

Though focused research goals or sampling of a portion of a cemetery may be prioritized due to temporal or monetary factors if a full excavation occurs, this does not excuse archaeologists from the application of the methodology necessary to “preserve by record” whatever the sample may include (May et al., 2015). The failure to do so in many cases resulted in more than an absence of data necessary to answer demographic questions or those about the taphonomy of the human skeleton. With the exception of a few examples, most American cemetery reports were deficient in a number of areas.
Obviously, it would be unhelpful to devote time and energy to speculating about areas which were not forthcoming in the material record. However, if it is not stated that such aspects could not be considered (i.e. “The study of parish records was envisioned, but the documents burned in the church fire of 1849”, “No coffin wood was found, so dendrochronology was impossible”) it calls the quality of the work into question and becomes unclear to others whether the sample is suitable for other types of research.

To thoroughly explore the sum of questions which may be answered by historical cemetery archaeology and by archaeological excavations in general is beyond the purview of this or any work which is not devoted exclusively to the subject. As with any archaeological population, historic cemeteries fit into their context through the resolution of certain basic questions (see Ubelaker, 1978; Brothwell, 1981; Buikstra & Ubelaker, 1994). Who was buried there? What time period were they from? What was the composition of the population? Where did they come from? What was their relationship to each other? What did they do for a living? What was their economic status? What were their daily lives like? What was their diet? What religion(s) did they practice? Were their practices in keeping with a single religious ideology, or was folk tradition observable as well? Was there an observable discrepancy in treatment by age, race, sex, or health status? Were they healthy? Did they show signs of violence? How did their community fit into the larger historical picture of the area? How did they die? How did they prepare their dead for burial? Did their burial traditions project a different ideological or material reality from that of their daily lives? Did they commemorate or monumentalize their dead, and if so how?

Questions can also be asked about the cemetery as a landscape. Are there archaeological features from later periods on or under the surface, for example church remnants? What was the original extent of the cemetery, and was all of it sampled? Was the burial place included in or isolated from the living space? Was it utilized for other purposes, like grazing or picnicking, simultaneously? Were burial traditions uniform or varied? Did the landscape shape the cemetery or did the cemetery shape the landscape? Did the cemetery develop in an observable chronological way, or was it divided more by social concerns? What happens to remains when buried in different ways? How does a cemetery fall out of use and out of memory?

Such questions can be explored on many levels. Records such as tombstones and parish documents will often give one picture (Tarlow, 1999; Herring & Swedlund (eds.), 2003; Mytum, 2000). Material culture may give another (Pye, 2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013). Osteology, with its insight into health, occupation, age, sex, familial relationship, and cultural background yields a third (Buikstra & Ubelaker, 1994). The study of archaeological data such as burial depth and arrangement a
fourth (Buckberry, 2000). Going a step further, ecological factors such as palynology, soils, botany, and faunal analysis add still another dimension to our understanding. It is only the study of multiple factors together that allows archaeologists to get to the meat of the basic questions. Did people describe their occupations cheerfully in letters, yet have the hallmarks of horrible osteological stresses on their bones? Did they profess to be firm Christians, yet superstitiously put a shoe on the coffin lid to prevent the dead from haunting the living? Does the maudlin monumentalization of a “beloved” wife reflect the experience of that woman in life?

Even if much of the data exists, the average excavation cannot hope to answer all questions in a single publication. However, if the data is recorded and presented sufficiently, later researchers can address many of them. Furthermore, in addition to these more intriguing theoretical questions about historical societies, there is great potential to place historical cemetery research at the forefront of archaeological research by enabling the study of questions like the ones originally addressed in this work. Historical cemeteries can be used to fully resolve some taphonomic questions if depth, soil, and/or bone density measurements are taken. They can be used to develop an effective preservation metric, or to improve existing age and sex metrics (Rose et al., 1996). Their osteological samples can contribute to studies of population genetics, migrations, and even uncured diseases. As Bahn points out, this information cannot be found in record alone (1984).

This is not really a call for revolution, but a gentle wake-up call for archaeologists to take the shortcut through the cemetery; that the ghosts which frustrate us are of our own making. If large portions of fundamental archaeological work often seem to be skipped in cemetery excavations in the United States, there is a need to first ask why this might be true, when archaeologists certainly know what professional standards require. There is also a need to quantify what facets of basic “preservation by record” are missing, lest the study fall into the same trap of vague disapproval that is so frustrating in excavated cemetery reports and participation in modern CRM projects. The second portion of this dissertation therefore attempts to explore and quantify some of the problems in current archaeological methodology in historic cemeteries. This is not an attempt to speak deeply about specific aspects of historic lifeways, or the historical sites themselves, but rather to critique our study of them.
PART TWO

Chapter 10: Publishing the Perished; Uniform collection standards and the future of cemetery excavations in the United States.

Research which is not available for others to use does not exist.
The hard work, time and money which went into the fieldwork and analysis have been wasted.
Part of our heritage from the past, along with some present resources, have been destroyed as totally and uselessly as if they had been dynamited or bulldozed over a cliff.
(White 1983, quoted in Connah, 1998 p 5)

INTRODUCTION:

One of the first things modern archaeological students learn in Archaeology 101 is that archaeology is controlled destruction (Renfrew & Bahn, 2012). If they began with illusions about traveling to exotic locales and discovering golden treasures, these are quickly replaced with a knowledge of Munsell charts, ten centimeter stratigraphic layers, and harsh reprimands for sloping trench walls (King, 2005). Although even archaeologists find such requirements tedious at times, the ones who continue in the field recognize their purpose: these basic steps, no matter how onerous, are the difference between archaeology and treasure hunting (Harris, 1989; Renfrew & Bahn, 2012). While every archaeologist probably rightly employs a bit of flexibility in the field, too great a departure from the textbook methodology results in, if not a falsification, a “subjectification” of conclusions as the scientific basis behind them falls away. Because the raw data (or lack thereof) behind interpretations is often not presented, and because the context from which it was derived is destroyed by the archaeological process, there is no way for the observer to critique them (King, 2005).

Most archaeologists themselves are probably wistful about this state of affairs. Given unlimited time and funding, many would happily indulge their interests as well as those of their colleagues with protracted projects. If this is the case, then why were historical cemetery reports largely so careless as to exclude the data which would have made the current project not only possible, but fairly straightforward? Unfortunately, a large proportion of the archaeology that occurs in the US and UK is done by private cultural resource management contractors (CRM) prior to construction (King, 2005; Merriman, 2004 a; Boyle, 2015). Often, the sites involved are encountered unexpectedly. Unless great historical significance can be assigned to a buried historical layer, archaeology may not even be considered as an option for
remediation in the US (ibid.). This may result in attempts at time reduction and cost-cutting which cut into the fundamental methodology of archaeology itself.

Unfortunately, it is difficult to quantify exactly what may be lost through such corner-cutting. When comparing techniques in the US and the UK, qualitative differences may still be seen, despite the frequency of CRM firms in both places. The extent of these differences, and the damage caused is difficult to measure. The collection of historical data in general has been criticized in Australia and New Zealand, with one author noting that while around 78% of reports existed in some published form, less than 50% included full descriptions of the findings (Connah, 1998). This has been blamed on a lack of a problem-driven approach to excavation which has caused other branches of archaeology to “…dismiss historical archaeology as merely descriptive data collection, lacking in theory, and generally unnecessary.” (Connah, 1998, p4). Historical archaeologists have criticized schisms within the discipline, with uneven importance placed on historical records research versus archaeological work (ibid.). Failure to publish their work widely and establish its importance in the field and among the public is another common criticism. Finally, overly imaginative interpretations are a criticism throughout the field of archaeology (McGovern, 1995). While data collection is the means rather than the ends of archaeological research, research problems must be defined by what exists in the archaeological record. (Reeve, 1998). It is not just historical archaeologists who are guilty of failure to study and publish, or to interpret conservatively. Prior to the advent of NAGPRA, one study found that an overview of 20,947 skeletons in excavated museum collections in the southern United States, 64% had not been studied for age and sex (Rose et al., 1996). Of the nearly 11,000 skeletons from Arkansas and Louisiana, 70.3% had not been analyzed at all. In the north, a slightly better 37.3% of 25,717 were found to have been analyzed. This lack of study presumably came as a surprise to law-makers trying to allocate funding for repatriation.

The original study illustrates the problems inherent in failing to publish and failing to collect data. Historical cemetery excavations reports, by virtue of the legal requirement that archaeological excavations preserve by record (Mays et al., 2015; RPA, 2016), and by virtue of widely accepted professional standards for the excavation and interpretation of human remains (Ubelaker, 1978; Brothwell, 1981; Buikstra & Ubelaker, 1994), ought to include osteological assessments of age and preservation. They would do well to engage with that data themselves, asking as the better cemetery reports have, questions about the origins, activities, and beliefs of the people buried. However, it is not possible to answer all the questions that data can possibly resolve in even an extensive report. There is a suite of basic data that should be presented in any archaeological report to meet the requirement of
preserving by record (see Buikstra & Ubelaker, 1994). This data varies from site to site dependent upon what is actually there, however it follows a basic format which was developed by the pioneers of the field and has been reiterated by the current generation of archaeologists (Reeve, 1998).

At their most basic, these are 1) Description of the context. This tells the reader why the project is taking place, where the site is found, and what changes it has undergone (Renfrew & Bahn, 2012; Reeve, 1998). It discusses the time period of study. 2) Methodology. As with any scientific endeavor, it is necessary to give a detailed account of which work was carried out and how. 3) Archaeological features. This aspect attempts to create a 3-D picture of the site above and below ground such that its dimensions and spatial relationships can be conceptualized by those who were not physically present during excavation. 4) Recording/Analysis of material culture. This ranges from a basic catalogue of objects to analysis of their chemical composition, again attempting to create a 3-D picture of objects and spaces. It should take into account things which cannot be observed at a macroscopic level, such as materials (ibid.). 5) Analysis of human remains. This is specific to burials, and includes such data as age, sex, ethnic background, stature, occupational stress, preservation, pathology and trauma (Buikstra & Ubelaker, 1994). 6) Interpretation. This is an attempt to give meaning to the other aspects studied by telling the reader about the population, the culture, the time period, site formation processes and so on (Renfrew & Bahn, 2012; Reeve, 1998).

It is not enough to present data in whatever format seems pleasing to the researchers: osteologists have noted the poverty of inconsistent recording methods had resulted in the inability to replicate results or even conduct the same tests in some instances (Rose et al., 1996; Buikstra, 2006 b, c, d, & e; Buikstra & Beck (eds.), 2006). In particular, the standardization of analysis that was emphasized during the development of NAGPRA has made some headway toward standardizing techniques overall. In 1988 the Paleopathology Association laid out the methodology which is to be used during CRM excavations of human remains (Rose et al., 1996). This publication was followed by the more formal, and now largely accepted, Standards for the Data Collection from Human Skeletal Remains (Buikstra & Ubelaker, 1994). The guidelines put forth by this and earlier publications in the same vein (Ubelaker, 1978; Brothwell, 1981) ensure that the large and complex datasets retrieved during such excavations are not wasted in a minimal publication which cannot hope to address all the questions yielded by the data set. Although a Standard Osteological Database was envisioned for NAGPRA projects, it has sadly not been adopted on a large scale by cultural resource concerns (Rose et al., 1996).
However, the lack of basic demographic data accessible for this project suggests that by and large, such recommendations are often not followed in the execution of archaeological projects in the United States. The following paper explores the relative success or failure of 109 cemetery excavation reports, largely conducted by CRM firms, to meet the basic recording goals of archaeology in general, and of burials more specifically. Because admitting one’s own deficiencies is difficult, the areas where archaeology is currently falling short may rarely be discussed in formal publication (King, 2005). It is insufficient therefore to say from working in CRM over a period of ten years that a problem can be acutely sensed: the problem, if one indeed exists, must be quantified. Once quantified, possible causes and possible solutions may be sought.
Publishing the Perished; Uniform collection standards and the future of cemetery excavations in the United States.

AMANDA MURPHY


As research in historic archaeology progresses, it is possible to explore numerous facets of past cultures through data retrieved from cemetery excavations. Despite this, only a handful of historic cemetery reports in the USA include the basic recording and analysis necessary to address specific research questions. Fewer still have been widely disseminated. To assess the extent of these deficiencies, 109 excavation reports were studied for their inclusion of data in five categories: osteology, artifacts, grave features, secondary sources, and synthesis. Reports were determined to focus on artifacts and historical background with other groups of information incomplete. Biological anthropology, archaeological methodology, and synthesis are particularly lacking. Because excavation and publication requirements are not uniformly robust in all states, report content often strongly reflects the priorities of excavators and their clients. To improve outcomes, guidelines must be developed to ensure uniform collection of these classes of information in all future cemetery excavations.

INTRODUCTION:

Historic cemetery studies are an emerging means of exploring past cultures (Herring and Swedlund 2003; Cherryson et al. 2012; Baugher and Veit 2014). In addition to answering questions about specific time-periods, communities, and individuals, excavated historic cemeteries yield large osteological datasets. These are tremendously useful in the study of more general bioanthropological questions regarding diverse subjects such as taphonomy, mortality, and pathology (Buikstra and Ubelaker 1994). Because post-medieval history allows access to rich information in the form of documentary records and living memory, historic archaeology is uniquely comprehensible. However, for the same reason, historic projects, especially those involving cemeteries, pose unique challenges to researchers. It is easy to make the mistake of relying too heavily on the fallible memories and incomplete records of the recent past (Herring and Swedlund 2003). This may cause researchers in the field to neglect traditional archaeological methods, rather than using them as a means to supplement and scrutinize historical accounts.

Furthermore, historic cemeteries are frequently large in scope and are often discovered unexpectedly during commercial development (Baugher and Veit 2014). These two factors may necessitate hasty and selective excavation, when multi-season field projects addressing clearly formulated research questions with numerous specialists would be more appropriate. Currently, legal and best-practice requirements for excavating historic cemeteries are unstandardized across the United States (Ubelaker 2011). While professional guidelines for the treatment of burials exist, the uneven state
requirements mean that these may be neglected in favor of speed and economics (Buikstra and Ubelaker 1994; Germen, 1996; English Heritage 2004, 2005; Cherryson et al. 2012). Publication and the dissemination of reports are also uneven (Baugher and Veit 2014). Together, these factors result in the generation of data which are either so meagre or so difficult to access, as to be defunct. This project attempts to take stock of the current state of historic cemetery excavation in the USA by analyzing available excavation reports from the past four decades. This will serve to identify which data are possible to collect, which data are most often neglected, how the presentation of data facilitates or prevents further research, and what steps can be taken to improve the collection and reporting of data.

**METHODS:**

One hundred and nine historic cemetery excavations were chosen for study out of nearly two hundred written volumes surveyed (See Appendix for full citation). The documentation used included excavation reports, watching briefs, theses, and articles, with the bulk of materials being full or partial excavation reports. These were chosen based on their attempt to include a variety of data. As many reports of this nature are not widely published, they were also chosen based on the accessibility of the document. Initially, accounts that ostensibly focused on a single aspect of a cemetery, such as artifact analysis, were avoided. However, as many documents were so minimally distributed that only remnants survived, these were studied as a measure of the longevity of the publication. The sites included in this

*Figure 1: Location of 109 Cemetery Reports Included in Study*

Variables including whether the work was done by an academic institution or a Cultural Resource Management (CRM) firm, the number of crew, the length of excavation, the number of features, and the
length of the reports were tallied. This enabled the general assessment of how basic planning factors influenced the quality of work produced. The reports were then evaluated on the inclusion of data in five broad categories: 1) grave features and archaeological methods; 2) osteological data; 3) artefacts and material culture; 4) secondary data and historical sources; and 5) synthesis. Each of these areas was further divided into relevant subcategories, for a total of 60 subcategories (TABLE 1).

Table 1: Five Categories & Sixty Subcategories Assessed

<table>
<thead>
<tr>
<th>GRAVE FEATURES &amp; ARCHAEOLOGICAL METHODS</th>
<th>EXCAVATION &amp; ANALYSIS TECHNIQUE</th>
<th>TESTING USED</th>
<th>TREATMENT OF SITE</th>
<th>RECORDING IN REPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Only CRM Firm</td>
<td>Hand Excavation</td>
<td>Hazards</td>
<td>Environmental Setting</td>
<td>Plan Views</td>
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<tr>
<td>Academic Institution General Methodology Field Methods Lab Methods Artifact Methods Historical Methods</td>
<td>Machine Excavation</td>
<td>Munsell Readings</td>
<td>Spatial Organization Use</td>
<td>Tables</td>
</tr>
<tr>
<td></td>
<td>Hand &amp; Machine Exc.</td>
<td>Soil (pH et cetera)</td>
<td>History/Taphonomy</td>
<td>Maps</td>
</tr>
<tr>
<td></td>
<td>Unclear Exc. Method</td>
<td>Flotation</td>
<td>Depth Possible?</td>
<td>Photos</td>
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<tr>
<td></td>
<td>In Situ Analysis</td>
<td>Botanical/Wood</td>
<td>Depth Data</td>
<td>Soil Profiles</td>
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<tr>
<td></td>
<td>Lab Analysis</td>
<td>Pollen</td>
<td>Shaft Data</td>
<td>Graphs</td>
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<tr>
<td></td>
<td>Lab &amp; In Situ Analysis</td>
<td>Parasites</td>
<td>Orientation</td>
<td>Illustrations</td>
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<tr>
<td></td>
<td>Unclear Analysis</td>
<td>Special Tests (DNA et cetera)</td>
<td>Body Position</td>
<td>Timelines</td>
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<tr>
<th>OSTEOLOGICAL DATA</th>
<th>ARTIFACT DATA</th>
<th>SECONDARY DATA</th>
<th>SYNTHESIS</th>
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<tbody>
<tr>
<td>Osteology Possible</td>
<td>Coffin Data Possible</td>
<td>Historic Background</td>
<td>Project</td>
</tr>
<tr>
<td>Preservation Possible</td>
<td>Coffin Construction</td>
<td>Funerary/Cultural Data</td>
<td>Background</td>
</tr>
<tr>
<td>Preservation Data</td>
<td>Artifact Analysis</td>
<td>Demography</td>
<td>Research Goals</td>
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<tr>
<td>General Age</td>
<td>Date Estimation</td>
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<td>Synthesis</td>
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<tr>
<td>Specific Age</td>
<td>Wood Analysis</td>
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<td>Sex Data</td>
<td>Fabric Analysis</td>
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<td>Race Data</td>
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<td>Pathology Data</td>
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<td>Non-/Metric Data</td>
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These categories were selected on the premise that a historical cemetery report has four primary data collection objectives in following the basic archaeological method (RPA, 2006; Renfrew & Bahn, 2012), conducting professional osteological analysis (Buikstra & Ubelaker, 1994), and addressing concerns specific to the material culture and background of historic cemeteries (Borstel & Niquette, 2000; Herring & Swedlund, 2003; Reeve, 1998; Springate, 2014). These are 1) to record subsurface features and finds using standard archaeological methodology 2) to conduct historical research 3) to perform expert analysis of both material culture and human remains and 4) to analyze, synthesize, and present relevant data for future use.

Each subcategory was judged on either the simple binary of “presence” or “absence” of data, or a tripartite division between “included/complete data”, “partial data”, and “excluded data”. This three-part
scoring system was used to ameliorate the subjectivity of certain categories, and the problems introduced by those reports without clearly stated methodologies. Examples of subjective categories include historical background, which was judged qualitatively by comparison to other historical background chapters. An illustration of a poorly stated methodology resulting in a score of “partial” might be the apparent omission of some aspects of a chapter that were typically present, without an explanation that sources were unavailable. Judged together, these categories provided a quantitative snapshot of the focus or focuses of a report. This was considered along with a subjective sense of the overall quality of the report in its context.

RESULTS:

General Findings:

Seventy percent of projects were primarily conducted by private cultural resource management (CRM) firms. Twenty-three percent were academic and seven percent were collaborative academic and commercial efforts. The average number of pages dedicated to a cemetery was 248 including citations and appendices. This was sometimes dispersed across multiple volumes. Because it was not always possible to obtain all volumes and sections of a report, this average is slightly underestimated. However, the survivability of a report was also considered to be an indicator of its quality, a lost or widely inaccessible report being of limited utility to the profession. Accordingly, such fragments were intentionally included.

European descent populations were most common (47%), followed by African American or mixed African American (25%), Hispanic/Native (10%), and Asian (1%). The average length of African American cemetery report was almost four times that of European cemetery reports, while Hispanic/Native cemetery reports were twice as long as European reports. Asian cemetery reports were slightly less lengthy. This may be due to the relatively small number of Asian cemeteries excavated. The remaining 17% of cemeteries were of uncertain or unassessed ancestry. These reports had an average of 76 pages, or half that of ethnic European cemetery reports, indicating that lack of analysis may have contributed to the uncertain status of these cemeteries. The year in which the report was written had limited correlation to the number of pages.

It was possible to calculate the number of burials excavated per day for 68 cemeteries. The average was 2.2, unless pure monitoring projects were excluded. Their omission reduced the average to 1.7 burials per day (N=59). The mode in both cases was a smaller amount, with 53% of excavations
averaging 1.5 or less daily independent of the number of excavators per burial. The overall average number of crew per burial feature was three. It was only possible to calculate the average number of individuals analyzed per day for three cemeteries. If burials per person per day were taken into account, the average was one. This rate is lower than the two burials per day expected as a professional average by English Heritage (2004). However, this is likely because few reports distinguished between time allocated to cleaning versus time allotted to analysis and recording. By one account, 360 burials took 1,094 person-hours for cleaning alone.

Although it was more common to encounter small, family-like cemeteries of European extraction, a number of small African American and mixed Native/Hispanic cemeteries were also excavated. While larger samples sometimes resulted in longer reports, sample size was not the best indicator of report length or quality. This correlated more closely with the US state in which the excavation took place, and which specific firm, institution, or specialists participated in the project. The year of the excavation also failed to correlate strongly with improved excavation. Though analysis techniques and comparative databases for osteology and artifacts improved over time, many of the most thorough research projects occurred on opposite ends of the spectrum, in the most recent and oldest projects in the study.

**Grave Features & Archaeological Methods:**

The first category to be explored was the archaeological treatment of cemetery excavations and grave features in particular. Methodological focuses are enumerated in Table 2. Eighty-three percent of reports made general statements about methodology, while 17% eschewed any sort of methodological description. In-depth field and lab methodology was described in around half of reports. Specific historical research and artifact analysis methodology were present in less than a quarter of reports each. Analyses of all four types clearly took place in more reports, as evidenced by presentation of results, however the processes were seldom described.

<table>
<thead>
<tr>
<th>General Methodology</th>
<th>Of which…</th>
<th>Field Methods</th>
<th>Osteological Lab Methods</th>
<th>Artifact Analysis Methods</th>
<th>Historical Research Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>83%</td>
<td>55%</td>
<td>47%</td>
<td>18%</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

Reports were initially studied for the presence or absence of archaeological data in eight basic categories. The results are presented in Table 3. Seven of these are standard for archaeological investigations. The remaining category, “hazard testing” for arsenic and mercury has been recently
recommended as a safety precaution (Borstel & Niquette, 2000). This is due to the use of these substances in historic medicine and embalming, as well as their inability to break down in the burial environment. Each category was typically rated by whether the relevant results were presented in the report. For example, if a report stated that soil profiles were taken, but they were never shown or their results discussed, they were scored as absent.

Table 3: Inclusion of Archaeological Data in Eight Categories

<table>
<thead>
<tr>
<th>Environmental Setting</th>
<th>Spatial Organization</th>
<th>Munsell Readings</th>
<th>Soil Profiles</th>
<th>Soil Samples</th>
<th>Flotation</th>
<th>Hazard Testing</th>
<th>Plan Views</th>
</tr>
</thead>
<tbody>
<tr>
<td>38%</td>
<td>32%</td>
<td>27%</td>
<td>27%</td>
<td>10%</td>
<td>13%</td>
<td>7%</td>
<td>53%</td>
</tr>
</tbody>
</table>

These eight categories had amongst the lowest inclusion rates of the entire study. Only plan views were present for more than 50% of excavations. However just a small fraction of these contained more than one or two examples. Other categories such as environmental setting, spatial organization of the cemetery, Munsell readings, and soil profiles accounted for around a quarter to a third of all projects in the report. The use of soil samples, flotation, and hazard testing was undertaken in less than 15% of all cemeteries.

The next aspect of archaeological methodology investigated was the means of burial excavation. The use of backhoes is known to be common in cemetery projects owing to their size and the difficulty of locating grave shafts. The extent of their use is not well quantified. Apart from monitoring projects, all excavations involved some level of hand excavation. This generally took place at the level of the coffin interior, using bamboo picks and other fine tools. Machine excavation described those projects which used a backhoe or leveler to remove soil to where coffin level was believed to start. Machine and hand excavation projects used heavy machinery to strip the site, but specifically began shovel skimming well above the anticipated level of burials. The means of excavation are enumerated in Table 4.

Table 4: Primary Means of Excavation

<table>
<thead>
<tr>
<th>Machine Excavation</th>
<th>Hand Excavation</th>
<th>Machine and Hand Excavation</th>
<th>Unclear/Unspecified</th>
</tr>
</thead>
<tbody>
<tr>
<td>54%</td>
<td>6%</td>
<td>20%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Of which 14% were principally monitoring

Machine excavation was most common, accounting for 54% of all projects. Fourteen percent of these were principally monitoring, where archaeological digging may not take place at all. Some level of backhoe stripping was used for 74% of all cemeteries. A combination of machine and hand excavation
occurred in less than a quarter of all cemeteries. Pure hand excavation was rare and was often used as a matter of necessity where it was not feasible to use heavy machinery.

Finally, grave depth, grave shaft dimensions, grave/body orientation, and body position were scored to assess the treatment of each burial as an archaeological feature. Grave depth was scored as complete where all graves had at least one depth dimension. Though rare, the best examples of this included depths at multiple levels, such as the top of the coffin, the level of the remains, and the base of the burial shaft. Scores of partial were given to those projects that only stated an average depth, or included depth data for some graves without explanation of why others were excluded. Grave shaft dimensions were scored as complete where a minimum of one length, one width, and one depth measurement was included. Although unusual, the most complete descriptions took multiple measurements in order to treat the grave feature as a dynamic 3-D object. This was especially useful for vaulted graves, which have between nine and eleven sides. Grave shafts were scored as partial if only some of the graves included measurements, if fewer than three spatial measurements were included, or if features such as vaulting existed without being quantified.

Grave and body orientation were scored as complete if the orientation for each grave was listed, or a count of graves sharing an orientation was given. The best examples included compass readings for each burial. Orientation was scored as partial if only some of the grave orientations appeared to be recorded, or the orientation for most graves was stated, without describing anomalies. Body position was scored as complete if an attempt was made to describe the arrangement of the remains in each burial and analyzed in terms of relevant funerary practices. Partial scoring was awarded if body position was described for some burials without explanation for its absence in others. It was also given if all burials were described generally, for example as supine, without attempting to describe the arrangement of hands and feet. The results are presented in Figure 2.

In these categories, only orientation was included in more than 50% of cemeteries. A further 25% had a general description of the most common orientation. Ninety percent had the opportunity to include grave depth data, yet just under half incorporated it fully. Giving an overall grave depth for the site was fairly quotidian practice (36%). Multiple measurements, on the other hand, were almost never taken. Body position was the most underrepresented category in all reports. Nearly half gave partial body position data (49%), however even the 30% with complete data were not typically very descriptive. This was occasionally attributable to preservation, while in other reports, the narrative was simply lacking. Grave shaft dimension was the most variable category. Thirty-four percent of sites reported
measurements in three dimensions. It was often clear from photographs that shaft dimensions changed with depth, yet had not been recorded. This resulted in the failure to document grave vaults where they were clearly present in at least 3% of cemeteries.

Figure 2: Treatment of Archaeological Features (Author, 2015)

Osteological Data:
Methodological approaches to collecting osteological data are presented in Table 5. For 95% of the sites, the collection of full or partial osteological data was theoretically possible. The remaining 5% of sites were either heavily analysis-restrictive monitoring projects, sites with very poor skeletal preservation, or the result of reports which did not attempt to quantify osteological data. The first aspect of osteological data to be considered was where the data was collected. Of the sites, 22% conducted analysis solely in situ. Forty-one percent transported the remains to a laboratory, either onsite or
elsewhere to conduct analysis. Only 6% of the reports specified that osteological data was collected both *in situ* and in a laboratory environment. Thirty-one percent of sites conducted no analysis or did not specify where analysis took place.

**Table 5: Primary Methodological Approaches to Collecting Osteological Data**

<table>
<thead>
<tr>
<th>Osteological Data Partially-Fully Possible</th>
<th>In Situ Analysis</th>
<th>Lab Analysis</th>
<th>Both In Situ and Lab</th>
<th>Neither/Unspecified</th>
</tr>
</thead>
<tbody>
<tr>
<td>95%</td>
<td>22%</td>
<td>41%</td>
<td>6%</td>
<td>31%</td>
</tr>
</tbody>
</table>

The inclusion of osteological data was considered under six headings: general age category, precise age category, sex, racial affinity, pathology, and metric/non-metric data. At some sites, data such as age, racial affinity, and sex could be gleaned from other sources. These included records, tombstones, or coffin size. Such data derived from secondary sources was considered in the separate demography metric, rather than in the osteological section.

Preservation data was studied first, as it was a precursor for the collection of other osteological information (FIGURE 3). It was considered to be present if Brickley and McKinley’s metric (2004) or similar was utilized and all figures were presented. It was partially present if a subjective description such as “good”, “fair”, or “poor” was enumerated for all burials. Preservation data was theoretically obtainable in 94% of sites, but it was only fully included in 25%. Most reports contained partial data or excluded it altogether. Where it was included, osteological photographs often made it clear that intersite comparison would not be feasible due to inconsistent application of the rubric for recording skeletal preservation. This made it difficult to judge the efficacy of other osteological analysis.

**Figure 3: Preservation Data (Author, 2015)**
The general ages metric tallied the minimum division of osteological ages into “adult”, “child”, and “infant” age categories. The cut-off ages demarcating these categories were not always described and varied from report to report. General age was considered complete if each burial was assigned to one of these categories where possible. This group was scored as partial if only a count of individuals within each category was given, or information was missing for some individuals without adequate explanation. The precise age category quantified cemeteries with specific age ranges, and followed the same scoring criteria. As with the general age category, these ranges varied from cemetery to cemetery. Sex and racial affinity were scored as complete where they were included by burial or fully enumerated in a description of the population. They were scored as partial if some of the information was inexplicably omitted, or if the data presented only what was average or most common. Metric/nonmetric data were scored by the binary present/absent categories, as they were almost always discussed in terms of averages or commonalities where present.

**Figure 4: Osteological Data (Author, 2015)**

- **General Age (Adult/Child/Infant)**
  - Included: 74%
  - Excluded: 16%
  - Partial: 10%

- **Precise (Numeric) Age**
  - Included: 54%
  - Excluded: 25%
  - Partial: 21%

- **Sex**
  - Included: 63%
  - Excluded: 24%
  - Partial: 13%

- **Racial/Ethnic Affinity**
  - Included: 41%
  - Excluded: 42%
  - Partial: 17%

- **Pathology**
  - Included: 43%
  - Excluded: 33%
  - Partial: 24%

- **Metric & Nonmetric Data**
  - Included: 40%
  - Excluded: 60%
Pathological recording was more difficult to quantify. Two factors are responsible for this. Compared to categories like sex, the number of possible pathological conditions that can be distinguished is large, and requires considerable expertise for a truly complete and reliable analysis. Unlike the other categories, which are judged by a more limited number of osteological markers, pathology may be present virtually anywhere in the body. Thus, it is easy to retrieve only partial data on the indicators of pathology, even on a skeleton which has been analyzed. The remaining osteological results are presented in Figure 4.

Three-fourths of cemeteries included general age ranges and just over half included more precise aging. Around two thirds described fairly complete sex data. All other osteological categories were not well represented; complete information was present in approximately 40% each of categories for racial affinity, pathology, and metric/nonmetric data. Where partial data was taken, it was typically sparse with unclear derivation. This arose from a poor description of burials as archaeological features, a failure to do preliminary recording in situ, incomplete or unclear osteological inventories for individuals, and poor preservation recording. Only 18% of sites included the full suite of possible osteological data, with most excluding all but one or two categories: typically age and sex.

Artifacts & Material Culture:

Material culture variables are presented in Figure 5. The quality of artifact and material culture analysis was evaluated based on three criteria: artifact analysis, coffin hardware, and the study of coffin construction. At least some artifacts were noted in all cemeteries, however recording varied considerably. Complete or partial coffin construction and hardware data was available for 96% of all sites; that is, burial containers were present. The general artifacts category included such items as clothing, personal belongings, and funerary inclusions discovered as surface artifacts. Artifact analysis was considered to be included where artifacts were fully documented by location and discussed in terms of their function and meaning. The most complete of these considered data such as cost, manufacture, and spatial analysis that allowed the researchers to draw inferences about specific articles of clothing or funerary practices. A score of partial was given in cases where artifact types were tallied for the site or otherwise documented but not thoroughly analyzed.

The coffin hardware category considered all burial accessories such as wood, lining material, and appurtenances left by the embalmer as well as hardware. The scoring followed a similar metric to that of personal artifacts, with enumeration earning a designation of partial and in-depth provenience and analysis resulting in a score of included. Coffin construction was partial if general coffin shape was
described for the cemetery overall. More complete coffin construction took into consideration additional factors such as secondary containers, dimensions, wood type, pigmentation, the use of lining, the pennyweights of the nails used, and the analysis of these variables by specific coffins. It was rare, even among cemeteries with a score of “included”, for all these factors to be considered.

Figure 5: Material Culture Data (Author, 2015)

Eighty-four percent of cemeteries scored partial or complete in each of the three categories. Those cemeteries falling into the “partial” categories for artifact and hardware analysis were often adequately documented, with photographs and descriptions taking the place of expert analysis. Although a similar percentage of sites included partial coffin construction data, the designation was more generous in this category: typically, a count of rectangular versus hexagonal coffins. Truly detailed consideration of coffin construction was rare. For example, fabric analysis was done for 6% of projects, and wood and botanical remains were only studied in 31%. Attempting to describe the preservation of artifacts or coffins was only done in 2% of cases. Ninety-five percent of all reports included date estimates. These were most commonly derived from material culture, historic records, or a combination of the two.

Secondary Data & Historic Sources:
Secondary data and historic sources was one of the most subjective categories. Unlike osteological analysis and material culture, which are fairly quantifiable, or archaeological methodology, which should be relatively standardized, historical study was limited by the variable history of a given area and the availability of records. Locating historical records can be a research project in its own right. Such records may include probate, parish records, local registers, wills, deeds, maps, censuses, tax records, bills of sale, advertisements, catalogues, newspaper articles, letters, photographs and many
more. While the potential for information is vast, the task of locating and studying such records is also daunting. Without knowing which sources were available it is difficult to assess the quality of historical analysis that has taken place.

The four categories considered were use history and site taphonomy; historic background; cultural/funerary context; and demography (TABLE 6). Use history considered whether the report discussed the recent history of the cemetery, including the formative changes to the site during its development and abandonment where applicable. Historic background referred to both the broader history and culture of the area as well as the individual history of the community that the cemetery served. This included general histories, such as economic development and major historic events affecting the region, and personal histories of those who lived in the area. Cultural and funerary context considered the burial practices specific to the community. Finally, demography considered the study of individual records and osteology leading to an analysis of population trends such as sex ratios, household size, and prevalence of disease.

**Table 6: Inclusion of Secondary Data and Historic Sources**

<table>
<thead>
<tr>
<th>Use History &amp; Taphonomy of Cemetery</th>
<th>Historic Background</th>
<th>Cultural Funerary Context</th>
<th>Demography</th>
</tr>
</thead>
<tbody>
<tr>
<td>21%</td>
<td>83%</td>
<td>37%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Historic background was frequently present, with 83% of projects including at least a general discussion. Cultural/funerary context was discussed in fewer than half of all reports. It typically took a standardized format where it existed, describing the concept of the Beautification of Death movement, religious beliefs, or local folk practices. A small number of cemeteries made a more thorough study, usually describing how material culture from the cemetery illustrated these principles. Demographic analysis was a lesser 35%. Under half of all such segments included in-depth demographic methods such as the study of Model Life tables, while the remainder simply collated and considered basic data gleaned from censuses and death records. Demographic chapters sometimes included inappropriate methods such as the use of Hazard Functions for osteological data sets. Use history and taphonomy of the cemetery had the lowest inclusion at 21%. This would appear to be the result of archaeological methodology which was not precise enough to consider these factors, and a lesser interest in post-use records, than in records that told the stories of the buried community.
**Synthesis:**

The analysis and synthesis rubric recorded to what extent a report stated the reasons a project was conducted, and attempted to place it in a larger research context. Subcategories included research goals, project background, and synthesis (TABLE 7). Research goals investigated whether the report clearly identified “aims” of the work either prior to excavation, or in relation to the data which was available once excavation was complete. Project background described whether a report included a discussion of the factors that lead to the excavation of the cemetery and the parameters of the project. Synthesis was dependent on most other subcategories such as demography, presentation of data, and osteological analysis. It was scored as included when the project attempted to analyze and discuss the data it had recorded in relation to a larger cultural context or research potential.

**Table 7: Inclusion of Synthesis**

<table>
<thead>
<tr>
<th>Research Goals</th>
<th>Project Background</th>
<th>Synthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>73%</td>
<td>19%</td>
</tr>
</tbody>
</table>

Seventy-three percent of reports included a project background, describing the need for excavation and the parameters leading to the final incarnation of the project. Only 20% clearly stated research goals. This would appear to be related to the belief that salvage projects either cannot have or do not warrant academic agendas. Synthesis was also highly limited. Just 19% of projects drew comparisons with other cemetery excavations, or attempted to study wider research problems with the new data that the excavation yielded. Few endeavored to synthesize all the information available. Most reports incorporated token maps and tables. While many also included some photographs, they were more illustrative than comprehensive. Perhaps because of sensitivity issues, photographs of human remains were also infrequent.

**DISCUSSION:**

Historical research was a component of 83% of reports, with almost none neglecting the category completely. Despite this, in-depth record analysis in the form of demographic studies, and the discussion of material culture from the cemetery in relation to funerary practices, was limited. Most reports included a moderate level of artifact analysis. This is likely because attempting to date the site is a primary goal of all archaeological research, and can often be achieved through the interpretation of artifact form. Furthermore, historic artifacts may be more accessible than human remains because they have a tactile
appeal as well as seeming familiar and readily-identifiable to non-specialists. Even where expert research was not carried out, basic descriptive documentation was more thorough for unique personal artifacts and elaborate hardware. Burial containers themselves were less likely to be thoroughly recorded. This may be because coffins, caskets, vaults, and utilitarian hardware are viewed as mass-produced and mundane, when in fact the details of their construction may be more varied and informative than the layman often imagines.

In terms of osteological analysis, over half of all reports included some general age and sex data. It was also common for a moderate level of pathological study to occur. Despite this, the overall level of osteological analysis was fairly poor: only 18% of sites made a thorough attempt to analyze and include the full range of basic data that was possible. Fewer than 10% carried out specialized analysis such as DNA testing, stable isotope analysis, and x-radiography. This may be due to intense time constraints, funding limitations, and the difficulty of employing a sufficient number of experts to record data in the field as well as the lab. Additionally, non-specialists may erroneously perceive age, sex, and pathology data to be the extent of osteological information, rather than a minimum requirement. Poor excavation and archaeological recording techniques are likely also a factor, limiting the level of analysis that could be carried out. Unfortunately, this was not always clear because of the lack of a good metric to describe preservation data, as well as a lack of thorough statements of methodologies in about three-quarters of all reports.

Archaeological methodology was poorest of all categories. Less than a quarter of all reports included full descriptions of their procedures, and almost all involved a heavy level of dependence on machine excavation. Basic feature measurements were taken in only about a third of excavations, while soil profiles and other standard methodology were even less common inclusions. While some of this may be due to accidental discovery, changing of firms between testing and excavation phases of projects, and the time pressures common among commercial excavations, it also seems to be partially attributable to general attitudes about historical archaeology and cemeteries in particular. There appears to be an erroneous belief that grave shafts and coffins are limited in form and therefore can be understood without study or even careful excavation, whereas unique artifacts and historic accounts may be regarded as more interesting or informative. There may also be a sense that historical communities are already understood from records, so there is little to be gained from diligently studying their material culture.

Reporting had limited focus on synthesis and answering larger research questions. This also appears to be attached to the view that such projects were frequently “salvage” excavations, whose goals
were restricted to collecting the bare minimum of data, as prioritized by the client and the available resources of the firm conducting the analysis. Furthermore, uneven state regulations and the high percentage of work conducted by CRM firms may result in limited publication and retention of reports once work is complete. Many of the most thorough reports occurred in the 1980s, as well as within the period from ~2005 to the present. Though certain techniques and comparative datasets were not as well-refined at the time of early reports as they are currently, the sense that historic cemeteries were uncharted territory in the 1980s seemed to have resulted in “by the book” methodology, and interaction between specialists. The improving quality of some recent reports may be fostered by improving regulations in certain states, an increased availability of rapid recording technologies, or backlash against the clearance-driven approach promoted by corporate interests.

Judging by these reports, a minimum of three crew members appear to be capable of excavating around a burial per day. Rates of burial analysis were more difficult to quantify because they were less frequently stated. In UK guidelines, it is commonly held that a trained osteologist can reasonably be expected to analyze an average of at least two burials per day (Mays et al. 2015). However, in the reports studied in this paper, a single technician managed only half this number. This may be the result of the expectation that technicians clean, analyze, and photograph remains for immediate reburial, exacerbated by ad hoc lab space, and a lack of specialists in the field to streamline the collection of remains. Improved reporting was seen in circumstances where excavation techniques were not heavily machine-driven, and where the burials were removed to a formal lab to allow time for reporting.

Generally, African-American and Hispanic/Native cemeteries received more thorough analysis than either Euro or Asian cemeteries, despite a higher percentage of European descent cemeteries located for this study. While this project is far from a complete survey of the prevalence of historic cemeteries excavated by ethnicity, the high incidence of European cemeteries fortuitously encountered (47%) seems contrary to earlier findings that European cemeteries are less likely to be excavated (Baugher & Veit, 2014). Certain minorities may be more willing to have their ancestors studied, and may perhaps be more demanding of good results. Alternately, they may have less political and social power to prevent scientific scrutiny. European populations may avoid analysis, or their input may simply not be sought. Overall, the best predictor of the quality of reports and sections of reports was the state where the excavation took place, and the company or specialists responsible.
CONCLUSIONS:

Historic cemetery excavation reports are lacking in many ways. Only about 6% of reports included all rudimentary data. The remainder of reports tended to favor one of three focuses: osteological, archaeological, or historical. Overall, twenty-one percent included every category of historical data, eighteen percent included full osteological data, and only ten percent included all archaeological data. As these percentages would indicate, most reports were historical, focusing on a combination of historic background and material culture. Osteological and archaeological reports were less common. Within the group of osteological reports, there were two sub-groups which tended to have either a heavily pathological or dental focus. Methodology was often neglected in historical and osteological reports, while research goals and synthesis were neglected in all but the most comprehensive reports. The presentation of historic cemetery data in a way that facilitates comparison and cultural understanding is still a rarity. More rigorous standards appear to be applied to minority cemeteries. Date of excavation did not necessarily correlate with improved reporting. Instead, the general quality of the work is best predicted by the state, company, and specialists involved.

While excellent guidelines exist for the recording of human remains, and historical artifact catalogues are more readily available (Buikstra & Ubelaker, 1994; English Heritage, 2004; 2005; Springate, 2014), a standardization of methodology for the excavation of historic cemeteries would be a boon to researchers. This should take the form of both the creation of detailed guidelines, and the adoption of such guidelines at a professional level. In practice, historical cemetery excavations necessitate at least four categories of specialist: namely experienced project archaeologists who can deal with a high volume of features, osteologists who are used to processing remains quickly, historical artifacts specialists, and historians/demographers. In all cases, adequate planning and recording strategies are essential to expedite the work.

At the outset of the project, it is necessary to consider whether the work may be streamlined by conducting a level of background research prior to breaking ground. Traditional subsurface testing methods may be unreliable in the relocation of historic burials, and researchers should be aware that neither historical cemetery “clearance” nor overbuilding and taphonomic processes are likely to have destroyed all remnants of a cemetery. Even where burial preservation is poor, other data will result from comprehensive recording. The need for community outreach should also be anticipated before the project begins.
When excavation begins, the field crew may need to be unusually quick and thorough, as they can anticipate the delineation and recording of a high number of homogenous, but nonetheless intricate features. A strategy should be devised for optimizing excavation, sampling, and transportation of burial contents to facilitate easy analysis. Where machine excavation is necessary, a skilled backhoe operator should be employed. Wherever expertise is lacking in the crew, expert supervision is essential. Plans should allow for variable grave depth and preservation. Field technicians must also be familiar enough with human remains and historical burials to recognize the remnants of them.

The cleaning, analysis, and recording of remains and artifacts should ideally be considered as a project in-and-of itself, with the necessary time, resources, and personnel allocated from the start. If long-term retention is planned, conservators are needed in addition to the artifact specialists and osteologists that should minimally be employed. Finally, reporting should be undertaken with the goal of documenting what work took place, describing the cemetery in its cultural and archaeological context, as well as attempting to present the data for future use.

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“Nadler’s (1989) investment-and-returns principle emphasizes the fact that significant change requires the investment of resources in terms of time, energy and dollars. To get successful change, one must be prepared to pay for it.”

(Emerald et al., 2002 p.37)

INTRODUCTION:

The previous paper illustrates that there is clearly a deficiency in the collection of basic archaeological data from historical cemetery sites in the US, with less than 10% of reports including most of the basic data that ought to be included following the standard archaeological method (RPS, 2006; Renfrew & Bahn, 2012), osteological recommendations (Buikstra & Ubelaker, 1994; Mays et al., 2015), and concerns specific to historic cemeteries (Borstel & Niquette, 2000; Herring & Swedlund, 2003; Reeve, 1998; Springate, 2014). In addition, very few conducted thorough analysis of human remains, which ought to be the central goal of studying a burial site (Landau & Gentry Steele, 2000). The answer to the question of how such a thing could happen is fairly agreed upon: time and monetary concerns mean that archaeological work must be very “efficient” (Merriman, 2004 a; King, 2005). In achieving efficiency, what the researchers consider unimportant, what they do not have the resources to do, or what they are ignorant of from a methodological perspective, may be cut. The question of why this is allowed to happen when it clearly violates professional standards, and what can be done about it are more complex.

From an ethical perspective, one need not look to philosophers to come to the conclusion that desecrating burials is considered to be “bad” in most societies (Sayer, 2012; Trope & Echo Hawk, 2000; Trope, 2013). From an ethical perspective also, it is a given that consistently failing to practice the technique that is preached throughout archaeological classrooms worldwide is a professional lapse (Meighan, 2000). Despite the frequency of CRM in Britain, the results of their reporting appear to be on average better than in the United States (Mays et al., 2015). Ergo, if American archaeologists want to continue to make the case that they are not desecrating burials in excavating and studying them (Meighan, 2000; Landau & Gentry Steele, 2000), they must at the very least be able to uphold their own principles. Given that the above statistics suggest that archaeologists are currently not accomplishing this in American CRM, what do the stakeholders – the descendants, the religious brethren, the affiliated
minority groups, the contractors themselves – make of the relocation of burials and the dubious role of archaeologists within it?

The reaction of the public to archaeological practice and archaeological education in general has been increasingly discussed as different groups are recognized as stakeholders (Merriman (ed.), 2004 a-c; King, 2005, Sayer, 2012). Cemeteries are likely to provoke a wider variety of emotions than many other types of sites. These range from fear and disgust, to indignation and outrage, to fascination as people grapple with their emotions about their ancestors or the dignity of the dead (Bahn, 1984). Much has been written about feelings surrounding death, burial archaeology, and display of the dead (see Metcalf & Huntington, 1991; Parker Pearson, 2000; Robben, 2005; Taylor, 2008), however these feelings may change when the dead in question are not bog bodies, ancient Egyptian mummies, or some distant indigenous tribe, but the recent dead (Sayer, 2012).

The input of “stake-holding” communities, particularly Native Americans, and increasingly African American and Afro British, has been very vocal, though archaeological and legislative interests have been slow to respond (Mihesuah, 2000; Fine-Dare, 2002; Chari & Lavallee, 2013 a; Sayer, 2012). It was not until 1981 that archaeologists officially recognized the priority of input from the communities being studied above their own (Breckenridge, 2014). Some have suggested by contrast that the violation of Euro Christian remains will be met immediately with outrage due to archaeology’s history of white western entitlement (ibid.; McGowan & LaRoche, 1996). Although it has been argued that the excavation of European-descent cemeteries is scarce in the United States (Baugher & Veit, 2014), Jamestown was in fact among the first archaeologically excavated burial sites. The previous paper also found a surprisingly high percentage of such cemeteries among those excavated. Whatever the reason, less has certainly been written about the reactions of Christians groups of European descent to the relocation of their dead. While there is some possibility that they are truly less excavated, it is also possible that less vocal response exists.

Regardless of whether the dead of European descent communities are disturbed in commensurate number, archaeology may still be seen as a paternalistic institution and marginalized groups have increasingly advocated for control over their dead. In the case of the African American community, this has been achieved by collaboration and public outcry (Jameson, 2004; Blakey & Rankins-Hill, 2011 a, b; Sayer, 2012). However native communities have been still more successful in securing their rights via NAGPRA legislation (Fine-Dare, 2002; Chari & Lavallee, 2013; Sayer, 2012; Mihesuah, 2000; Breckenridge, 2014). As Talmage has noted individuals are more likely to secure the rights to their dead.
through legal means than archaeologists are likely to secure the rights to excavate (cited in Bahn, 1984, p219). In the case of NAGPRA, though museums can assert the “right of possession” to prevent the deaccessioning of all artifacts, the default has still been to Native interests (Breckenridge, 2014). In general, archaeological behavior appears to depend upon the law, and the creation of law appears to be a direct result of public sentiment.

In both CRM and the implementation of NAGPRA, archaeologists have cited funding as a significant obstacle to carrying out work to a reasonable standard (King, 2005; Boyle, 2015). In terms of skeletal analysis, actually securing the amount of time and expertise needed can be difficult (Landau & Gentry Steele, 2000), but public uproar has typically aided archaeologists in this area (Rose et al., 1996). Grant money in the amount of 31 million was given from 1994 to 2008 for NAGPRA inventories (ibid.). During projects such as the African Burying Ground, additional funding was allocated to the project to address the manifold concerns raised during public protest (Jameson, 2004; Blakey & Rankins-Hill, 2011 a, b; Sayer, 2012). In other instances, excavations have been indefinitely halted when commensurate funds could not be secured to address the public’s negative reaction to the state of excavation (KWTX, 2008; Waco Tribune-Herald, 2008). In short, though archaeological practice surely needs more credence and backing to perform their work, their access to it lies not through the protestation that “archaeological science is important” but through the opinion of the people (Mallouf, 2000; King, 2005). The law is the key and the public hold it. As such, they may be a useful wedge for reframing the legal debate about the role of excavation in construction.

Legislation like NAGPRA is not without its difficulties, both theoretical and practical. To say the debate has been heated would be an understatement. Archaeological traditionalists, have argued vehemently that NAGPRA unreasonably places tribal voices, those of trouble-making minorities within tribes no less, on equal footing with all-important archaeological “science” (Clark, 1996; Meighan, 2000). Some have contended that archaeologists have a mandate to retain and continue to acquire remains for study, and that any compromise is a dereliction of their ethics (Meighan, 2000). If the most extreme of these views are to be believed, NAGPRA exists only because of politically-correct mewling and has no basis in what the tribes themselves actually want or is good for them (Clark, 1996); a viewpoint which is manifestly false. Although not all tribal entities agree with or have advocated for NAGPRA, many have and continue to do so (see Fine-Dare, 2002; Chari & Lavallee, 2013 a; Sayer, 2012; Mihesuah, 2000; Riding In, 2000; Breckenridge, 2014). Furthermore, such views overstate the
benefits of science above all other priorities, and exaggerate the position of archaeology as a science (Dumont, 2013).

A more common and moderate concern among archaeologists is against opening the door to tribally “nationalist” interpretations of ancient remains; for example, appropriating very ancient remains like Kennewick Man without hearing alternate views (Owsley & Jantz, 2014). Such remains are so ancient as to have great significance to humanity as a species. Additionally, their affiliation really would be quite dubious in the absence of scientific testing (ibid.; Zimmerman, 2000). This is also the case with younger, culturally unidentifiable remains (Ambler & Goff, 2013). From an osteological standpoint, it is quite understandable that unprovenienced remains, on which destructive DNA testing is not allowed, cannot always be linked to a locality let alone a specific group (Landau & Gentry Steele, 2000). Yet Native interests have seen this as museums intentionally obfuscating origins which seem obvious to them, in order to forestall repatriation (Dumont, 2013). Because of this “gate-keeping” by archaeologists and anthropologists, Native groups have often been disappointed to find that NAGPRA has not resulted in the sweeping and immediate return of their cultural patrimony (Hemmenway, 2013). This has not been helped by vocal advocacy against NAGPRA by archaeological groups and institutions such as the Society for American Archaeology, the American Anthropological Association, and the Smithsonian (Trope, 2013).

From a Native perspective, the failures of NAGPRA are a continual reopening of deep-seated cultural wounds (Deloria, 2000; Mihesuah, 2000; Riding In, 2000). According to some Native individuals, modern archaeologists have committed “…abominable acts of sacrilege, desecration, and depravity. (Riding In, 2000, p 109). Archaeologists may perpetuate racists views of Native Americans as “ignorant”, “ridiculous stereotypes”, and “subhuman” (Mihesuah, 2000). They may “condescendingly” and “duplicitously” claim themselves as the “true spiritual descendants” of the people they study (Riding In, 2000, p 113), or usurp the right to interpret Native spirituality through archaeology because of their own lack of “authenticity” and “profound spiritual poverty” (Deloria, 2000). Although such extremes of racism have certainly existed in the past and probably persist among a minority archaeological professionals today, the community as a whole increasingly recognizes the need to respect the viewpoints of descendant groups, and practices archaeology not out of a lack of authenticity, but from a sincere interest in the profession, the past, and the groups that they study (Klesert & Powell, 2000).

On a logistical level, the implementation of NAGPRA has also been fraught with conflict. The scope of change was not fully anticipated and attempted to follow rigid deadlines rather than a directed
vision (Abraham et al., 2002). Despite the increased funding, many complained that it was still a significant obstacle preventing the thorough research that was now demanded (Rose et al., 1996). Interestingly, this funding deficiency may have been based on the erroneous but rather natural assumption by law-makers that museums in general possessed much more thorough inventories of their collections than they in fact did. As with excavation reports, the fact that museums in many cases were not even aware of that they had and where it came from, turned what ought to have been a relatively simple matter of returning certain objects and remains to certain affiliated groups, into a leviathan task of study and inventory (Capone, 2013; Ambler & Goff, 2013).

Numerous revisions and addendums to NAGPRA have been one result (McKeown, 2013; McKeown et al., 2013; Ambler & Goff, 2013). Perhaps in consequence, though change was ensured via legislation and focused resources, deep cultural changes could not keep pace (Abraham et al., 2002). This is true both for tribal members or entities with anti-archaeological feelings (see Deloria, 2000; Riding In, 2000; Dumont, 2013; Hemmenway, 2013), and archaeologists who have long felt entitled to study remains and objects of cultural patrimony unhindered (see Clark, 1996; Meighan, 2000).

Achieving “balance” is also perceived as a continuing and perhaps irredeemable failure of the law (Meighan, 2000; Keller O’Laughlin, 2013). Archaeologists, tribal groups, and even groups within tribes simply want different and often irreconcilable things by some estimates (Mihesuah, 2000). Native Hawaiian disputes are one example where groups with equal claim under the law can rarely come to resolution regarding what should be done with remains about which different groups hold incompatible beliefs (Greer, 2013). The legislation has also left tribes who are not federally recognized without the power of their “recognized” counterparts (Trope, 2013; Neller et al., 2013); a situation which illustrates the powerless position of other western groups to give input into the treatment of their dead. Finally, even those archaeologists who might otherwise be happy to comply with NAGPRA, are cognizant of the impossibility of accommodating all of the coexisting and sometimes contrary beliefs of different groups.

This is not a failure of the intent of NAGPRA. Many assumptions and oversites necessarily occurred in such a substantial legislation; time and effort was needed to work out some of the kinks (McKeown et al., 2013; Ambler & Goff, 2013). As with any resisted cultural change, time was also needed to let the effects sink in and alter the feelings of the parties involved. In their 2002 work, Abraham and colleagues discussed the resistance to change that museums faced. They suggested that four components were necessary: identifying dissatisfaction, building participation, building rewards, and providing time and opportunity for people to disengage from the present state (p. 37). NAGPRA also
fared better in institutions which secured line item funding for it, created centralized structure for dealing with it early on, and eliminated potential conflicts of interest as they arose (McKeown et al., 2013). Though NAGPRA in the eyes of many took interesting objects and sites out of archaeological control, it also provided a bonanza of resources which did not exist before, and a much-needed impetus for archaeologists to study collections they had been neglecting (Rose et al., 1996). Rather than focusing on the negatives, archaeologists should be enthusiastic about the possibility of similar laws that require more archaeological engagement from the start.

Corporations and the public may also remain skeptical (Merriman, 2004 b). However, the fact is that archaeological sites including burial grounds will continue to be compromised by development interests (King, 2005). The real question is how to frame archaeology in such a way that conducting high standard archaeological investigation becomes a default in their removal, rather than just one among several options. Unfortunately, “the public” is not really a unified group with unified interests. Within specific NAGPRA cases, sub-groups may exist between or even within tribes with conflicting desires (Byrne, 1993; Greer, 2013; Breckenridge, 2014). It has not always been enough that some member of a tribe has given away ethnographic information to researchers or sold an artifact to an outsider. It is not enough to have Navajo permission to study a burial, saying that they prefer to not even hear about the project, if the neighboring Acoma feel that it should be relocated without study, while the neighboring Zuni feel that it should be left in place. Diverse opinions must be anticipated, yet it may not be possible to accommodate all of them (Keller O’Loughlin, 2013). Though the opinions of some vocal Native groups, and some vocal African-descent groups have been studied (Fine-Dare, 2002; Chari & Lavallee, 2013 a; Sayer, 2012; Mihesuah, 2000; Breckenridge, 2014), it has been rare to seek nationwide and local opinion on burial archaeology, particularly that of ancestor/affiliated communities, until a site is encountered, and perhaps half-destroyed.

In historical cemetery archaeology at least, there is a unique opportunity to engage with the public through genealogical research. Archaeological excavations are an excellent opportunity to seek out and collate records which may not be easily available to private individuals. There is also a great opportunity to help African descent communities, and potentially others, connect with lost history (Blakey & Rankins-Hill, 2011 a, b). On a local level, there is a chance to enrich the known history of a place, be that one of goldmining, warfare, industry, migrant work, or colonization. At a national level, these stories together can tell a larger story of the Irish diaspora, Chinese secondary burial in the homeland, or Civil War medical practices. In the removal of specific cemeteries in the western world,
there may be discussion of ethnic Chinese, Japanese, or Hispanic community reaction to the project (Burton et al., 2001), but little has been written about the wider reaction of these communities. The “white” or European descent community is essentially not even considered to be a voice in cemetery relocations (Baugher & Veit, 2014), despite the rather high frequency of their actual involvement seen in the above excavations.

Unfortunately, any rebellious voices within these unheard communities may not expressed in excavation reports written by archaeologists under duress, and submitted to clients (King, 2005). Both parties have a vested interesting in showing records of the project through rose colored glasses: the archaeologists, because they want the work of their firm to seem professional and efficient to colleagues, the client, future clients, and governing agencies; and the contractor, because they want to seem ethical to governing agencies, their clients, and the consumer. As the continuing debate about NAGPRA illustrates, some archaeologist in general may be tempted to gloss over the failings of the profession out of fear the puissance of local groups to deprive them of their data sources (Meighan, 2000).

Because of this, the following paper looks to outside sources to help elucidate how the public feels about burial relocations in their communities, involving recent remains that they may feel kinship with. This takes the form of investigating burial archaeology in the popular media, and news reports of specific cemetery excavations and the community response to them. Many have explored the presentation of archaeology to the public in media, education, and archaeological outreach: an overwhelming conclusion has been that archaeologists are often unsuccessful at impressing “their” scientific conclusions regarding the past on the public, with the public instead seeking the elements that most provide entertainment, validation, or a leisure experience as a primary goal of archaeology (Merriman 2004 b, c; Copeland, 2004; Acherson, 2004; McDavid, 2004). In this vein, the trend that Acherson observed regarding the dramatization of archaeological programming, has swung farther into the realm of unmitigated showmanship with the advent of reality television (2004). As the following paper will show, the collision of the primary public understanding of archaeology as a source of entertainment may become especially severe when something as serious as death and respect for ones’ ancestors is involved.
**Hollowed Ground; Where destruction becomes respect in bioanthropology.**

A. Murphy


**ABSTRACT:**

Biological anthropologists are sometimes portrayed as being complicit in the destruction and even desecration of burials in the course of cultural resource management projects involving historic cemeteries. This is largely owing to public unawareness of the corporate insistence upon cemetery clearance and fate of bodies removed via non-archaeological means. In reality, it is rare for archaeologists in the US and UK to be allowed to participate in the relocation of historic cemeteries at all. Exhumation contractors, who commercial interests may legally employ for this purpose, regularly separate family interments, disarticulate individuals with heavy machinery, and disregard meaningful ethnic or religious considerations during reburial. Public perception alone renders this destruction “more respectful” of heritage than archaeological research. Ironically, it is often communities who were disenfranchised in life, such as slaves or poor house populations, who receive more delicate archaeological treatment and more heritage-considerate reburial. Modern western perceptions of mortality require “the dead” to remain largely invisible once buried. Ambivalence about the sacredness of the corpse in an increasingly secular society may equate scientific scrutiny, no matter how deferential, with unacceptable invasion. Conversely, literal destruction may be accepted if it is performed out of sight.

**INTRODUCTION:**

From Indiana Jones to Stonehenge, archaeology has a special place among the sciences in the popular imagination. Yet, when it comes to the excavation of recent burials, this fascination can turn to ambivalence and even outrage (Sayer, 2012). This results from two ethical conundrums. Firstly, the idea that the dead can be moved at all is sometimes uncomfortable (Crossland, 2009). Traditionally, the placement of the dead has been used as a way of claiming ownership of the landscape (*ibid.;* Cherryson et al., 2012). In Judaeo-Christian tradition in particular, there may be a strong feeling that buried individuals must return to the earth or await the final judgement there. The living protect them on this journey by ensuring that they rest in peace. To remove the deceased disrupts this cosmological drama, and may be seen to overturn the sanctity and respect that their community displayed in performing funerary rites. Even where ancestors are distant or unaffiliated, if the current residents identify with them in an esoteric way, such disturbance becomes a challenge to their ownership of the land and of the history of the area.

Secondly the idea that the dead are being scrutinized in some “unknown but scientific way” is often upsetting to the modern zeitgeist (Sayer, 2012). Since Puritan times, the western world has undergone an ideological shift from viewing the dead body as a decaying corpse awaiting resurrection, to the romanticized Victorian view that they ‘are only sleeping’ (Jackson, 1977; Curl, 2001; Cherryson et al., 2012). As frontiers expanded, individuals died further away from home (Kelly, 2012). Embalming,
once rare, became the norm and the modern funerary industry arose. By capitalizing on public disgust at
the insalubrious conditions of overcrowded urban burial grounds, the funerary industry gradually
established itself as the only sanitary option for dealing with the dead (Curl, 2001). This has evolved to
unnecessary extremes in the name of public health in the modern day, facilitating the illusion that nature
may be cheated indefinitely (Matson, 2012). These illusions persist, while the dead remain buried. In a
progressively secular culture that is aware of decomposition, yet increasingly indecisive about the
afterlife, the post-funerary dead have become an elephant in the living-space of western thought (Matson,
2012; Crossland, 2009; Kelly, 2012). Archaeologists unabashedly violate this taboo by seeking the
remains of the dead and studying them in depth.

Unfortunately, in the course of urban development, old cemeteries and burial sites are frequently
encountered and moved (Jervais, 2009; Shelbourn, 2010). At such times, the public is confronted with
the dead and any sense of injustice or impropriety that their relocation may engender. Archaeologists
often find themselves the reluctant public face of the corporations responsible for transplanting the
deceased. Exhumation contractors- essentially reverse funeral-directors- may also be employed in this
capacity (McGowan & LaRoche, 1996; Engber, 2005; Brown, 2012; Carvajal & Grzybowski, 2014).
There are no reliable statistics on the number of exhumations versus archaeological cemetery projects
that occur in the US and the UK within a year. However, exhumations and archaeologically monitored
exhumations are relatively more common than full archaeological excavation (White, 2011; Townsend,
2012). Exhumation work is often more rapid, sometimes occurring on the same day as discovery
(Williams, 2014). As a result, it may be less publicized (See Weiss, 2004; Bainbridge, 2014; Williams,
2014). If the public takes notice at all, it is usually too late to change the outcome of the project (Weiss,
2004).

It is possible for exhumations to proceed so quickly because they employ less meticulous
standards than archaeology. The tools may range from mechanical excavators to shovels. The level of
clearance can encompass only the visible bones, to a certain depth below the surface, or a certain volume
of soil (McGowan & LaRoche, 1996; Engber, 2005; Brown, 2012; Carvajal & Grzybowski, 2014). Such
methods are necessarily destructive. Partial or even whole remains can be left behind in graves which are
considered to be sterile. In cases where the identity of the dead is unknown, cultural or religious
affiliation will likewise be unknown and ignored during reburial, because remains are typically not
studied. As exhumation contractors are often also funeral interests, they can usually perform
reinternments themselves (ibid.). Owing to such factors, corporations often prefer this option.
Oddly, the public also may favor it. The exhumation contractor is seen as having a rightful place in western burial ritual, while archaeologists may seem to be doing something sinister or mysterious with the dead (Sayer, 2012). This is based not on the relative levels of respect, or even the amount of destruction occurring, but on public opinion of the funerary industry, of funerary archaeology, and lingering patriarchal injustice. This article seeks to explore the reception of cemetery relocation projects in the media and popular culture, and how such depictions shape the public perception of archaeology versus exhumation. In particular, the rise of archaeology as entertainment may collide with the serious feelings which can be stirred up by the dead. Cemetery projects are thus understood in emotive terms, which do not address the realities of the work that ultimately takes place when a cemetery must be moved. The result is a backlash against archaeology, even as more destructive exhumation projects go unnoticed.

Who Do You Think You Are: What Does the Public ‘Know’ About Archaeology?:

Part of the collective ambivalence surrounding archaeology stems from the fact that the public is unclear about what archaeology entails. Archaeologists are sometimes confused with palaeontologists (Webb, 2013; Leather, 2013). In the media, the most familiar brand of ‘archaeology’ may be the fantastical portrayals in “Indiana Jones”, “The Mummy”, or “Tomb Raider” (Germain, 2008). While the average viewer probably recognizes the supernatural and pyrotechnic elements of such films for what they are, the reality of the archaeological ‘science’ depicted may be murkier. This is not completely without basis: at its inception, antiquarianism was a quest for curiosities to be placed in museum collections. Little regard was given to context, technique, or the wishes of those most closely associated with the sites (Ubelaker, 2011; White, 2011; Kloor, 2012). This has had lasting effects on the collective memories of Native Communities, whose ancestors’ tombs were sometimes raided for artefacts. Unhelpfully, in “Indiana Jones”, the only people who seem to practice archaeological technique are quite literally Nazis (Germain, 2008).

In recent years, the major US educational television stations have also shifted their archaeological focus from documentaries, to reality, drama, and fringe-theory programs with archaeological plotlines. Reality television shows such the Spike Channel’s “American Digger”, the Discovery Channel’s “Treasure Quest”, National Geographic’s “Diggers”, and “Nazi War Diggers”, do little to dispel the image of archaeologists as adventurers in search of treasure (Zorich, 2009; Carter, 2012; Kloor, 2012; French, 2012; Moaba, 2012; Brockman, 2014; Thornhill et al., 2014). Although only “Treasure Quest”
features archaeological professionals (Westcott, 2007; Zorich, 2009), all capitalize on the public’s fascination with discovery and blur the lines defining who archaeologists are. From a professional viewpoint, all have been criticized for glamourizing looting, not clarifying the legal contexts in which it is acceptable to metal-detect, illegally salvaging hoards, failing to publish data, and contributing to historical misconception in order to forward their commercial agenda (Carter, 2012; Kloor, 2012; French, 2012). Legendary sites yield more marketable treasure, and the assertions of television personalities regarding their sites are never subject to scientific peer review (Zorich, 2009). While adversarial viewpoints may arise in the news, the programs themselves are often uncritical of these issues. The National Geographic Channel and The History Channel in particular lend an aura of reputability to the hosts of their shows, even when no science is being practiced (Knapp, 2011).

Conversely, forensic shows like “Bones” and “CSI” overstate the ability of physical anthropologists to make accurate, on-the-spot determinations of characteristics like age, sex, and cultural affinity when examining human remains (Matera, 2010; Watercutter, 2011; Datta, 2013). This may lead contractors and invested members of the public to feel that archaeologists are incompetent when they cannot produce similar outcomes where bones are concerned. When it comes to cemeteries, even those familiar with other types of cultural resource management projects may not fully anticipate the scope of work incumbent in such large, multi-feature sites (Schaper, 2005; McDaniel, 2007). An illustration of this is the Texas Ranger’s Museum, which was to be expanded over Waco’s forgotten First Municipal Cemetery. Archaeologists were told by the client that the excavation and analysis of over 300 burials should take no longer than 30 days (Waco Tribune-Herald, 2008). When they failed to achieve these results, they were replaced and faced with legal action (KWTX, 2008; Waco Tribune-Herald, 2008).

It might be expected from this example that amateurish work would provoke greater outrage. Yet archaeology, partially as a consequence of its media portrayal, is a profession where dilettantti are lauded. News sources have represented laypeople as equal stakeholders, giving voice to the views that archaeology is fundamentally no different than metal-detecting, or that archaeologists unfairly hoard history (Moaba, 2012; Kiger, 2012). Following accusations that their brand is abandoning their science-driven origins, National Geographic has been somewhat more sensitive to the criticisms of archaeologists, by promoting responsible metal-detecting and presenting archaeological technique as a separate practice (Kloor, 2012; National Geographic, 2015). Despite this, the channel went too far for many when metal-detecting of burials featured in one of their programs. The show “Nazi War Diggers” was due to premier in May of 2014, but it provoked such outrage among professionals and descendants...
of soldiers that it was pulled before airing. It followed hobbyist metal detectors as they dug up the graves of servicemen in Eastern Europe (Brockman, 2014; Thornhill et al., 2014). A video preview showed one of the presenters wrenching a femur from the ground and misidentifying it as an arm bone (ibid.). The program’s production company claimed, “…a video excerpt from our show posted on our website did not provide important context about our team’s methodology” (Brockman, 2014). To a physical anthropologist, this is simply posturing: the act of yanking a half-buried bone out of context and misidentifying it belies a complete lack of skill or methodology. A lay person, however, is left in confusion: is this archaeological procedure? They are left to conclude that, were their ancestors to be excavated, their remains might be similarly handled and their belongings sold to the highest bidder.

This concern became manifest during the excavation of St. Johannes Cemetery under Chicago O’Hare airport (Hilkevich, 2010; Daily Mail, 2011; Smith, 2011). This case is unique in that the city engaged in a legal battle to strip the cemetery from the ownership of the church (Daily Mail, 2011). Though the airport agreed to archaeological excavation of the remains by a CRM firm, the public remained understandably suspicious. One descendent expressed his concern, "Some of the elders were buried with pocket watches…. Someone could easily run off with it because the city is banning the families from observing the relocation," (Bob Sell, in Hilkevich, 2010). To many, the threat of excavation away from the public gaze was reason enough to hire private exhumation contractors to have the remains of their relatives removed (Hilkevich, 2010; Smith, 2011).

This does not reflect a well-rounded understanding of archaeology versus exhumation. Minimum professional standards dictate that personal belongings not be stolen in either context. Archaeological practice, as standardized by Brothwell (1981); Buikstra and Ubelaker (1994); the British Association for Biological Anthropology and Osteology (Brickley & McKinley, 2004); and English Heritage (English Heritage 2004, 2005; White, 2011) lays out detailed techniques for carefully excavating human remains which, in theory at least, should be followed during all archaeological excavations. This includes, at a minimum, careful excavation with precision tools. Ironically, the descendants in the case of St. Johannes were fearful that archaeological excavation would be “an inexact process” (Hilkevich, 2010).

In the UK, where both archaeological documentaries and public engagement are more deeply embedded in society, such unfounded fears are rarely expressed. The BBC website contains an archaeology section, including detailed segments on the scientific study of archaeological remains (Richards, 2011). “Time Team”, which ran for twenty seasons on the BBC, was a beloved series presenting ongoing archaeological projects to the public. The program claimed to be one of the biggest
funders of field archaeology in the nation and the presenters, themselves archaeologists, participated in the production of academic publications during its run. In recent years, archaeologists left the program when producers introduced a former model as a co-host and departed from the show’s scientific focus (Arnold, 2012). When it comes to remains, archaeologists have found that the British public is overwhelmingly interested in engaging with the dead via museums and excavations (Parker Pearson et al., 2012). Thus, objections to archaeological removal of remains in the UK have been linked to more political causes, rather than true scepticism of archaeology as a practice (ibid.; Sayer, 2012).

In the US, pseudo-archaeological methods may be readily accepted by the public if the source is seen as legitimate. Contrasting the example of Chicago O’Hare, is the amateur excavation of Irish-American railroad workers’ graves from an area known as Duffy’s Cut, Pennsylvania. They used “pick axes and spades,” and dug until they “struck … bone with a shovel,” (Tucker, 2010). The participants had no archaeological training and no construction project necessitated the removal of the remains. Yet, unlike St. Johannes, no outrage resulted. Instead, the Smithsonian Magazine and the New York Times both published enthusiastic articles about the project, drawing attention to the passion of the diggers and the fact that the men were both competitive bagpipers of Scots-Irish descent (Tucker, 2010; Barry, 2013). To their credit, the men responsible for the project employed a physical anthropologist and engaged in DNA testing for the purpose of analyzing and repatriating the remains (ibid.). In both cases, it was not the methodology that was central to whether the work is perceived to be good. At Duffy’s Cut, it was the fact that the project has been cast in the light of two Irish-Americans engaging with the remains of “their” Irish-American ancestors. At Chicago O’Hare, it was the fact that the descendants were deprived of control over the remains of their ancestors.

Despite concerns about encouraging poor techniques, modern archaeologists recognize the need for the public to be able to physically engage with their history. Community involvement and volunteering is increasingly advocated for within archaeological programs (Sayer, 2012). Some archaeologists retain ambivalence about this state of affairs, and may continue to be accused of leaving the public in the dark (Harrington, 1993; Anderson, 2000). From their perspective, allowing non-archaeologists to dictate what is permissible and necessary during a project may seem as incomprehensible as allowing someone without a medical degree to perform an operation. Others see archaeologists as a perpetuating patriarchal behaviors, with the prioritization of scientific inquiry over descendant concerns placing them on the same footing as a stranger who insists on giving someone else’s grandmother’s eulogy (Parker Pearson et al., 2011). Both parties have valid points: science ideally
should neither be sentimentalized nor politicized by special interests, yet if science appropriates the privilege of narrating history, it politicizes itself. The compromise of encouraging public participation in archaeological excavation is one way to cater to those with an interest and allow them to contribute, while monitoring their progress and spreading awareness.

**The Letter of the Law, But Not the Spirit:**

The varying standards with which archaeological tasks are conducted necessarily stem from the abstruseness of the law. Burial Law in the US and UK can be complex and unevenly applied. In the United States, sites of historical significance on Federal Land are subject to the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), and the Native American Grave Protection and Repatriation Act (NAGPRA) legislation (Ellis, 2000; Ubelaker, 2011). Briefly, ARPA oversees the protection of archaeological resources on public and Indian lands. NHPA deals with the evaluation of federally funded or approved projects on registered sites of historical significance. NAGPRA applies to Native burials and objects of cultural patrimony on Federal Land and in federally funded institutions (Ubelaker, 2011). Among other things, it ensures that local tribes are consulted when Native remains are likely to be encountered. These legislations are limited in that they mostly apply to Federal, Public, Indian Land, and specific locales that have been listed under NHPA. NAGPRA only applies to objects, sites, and remains relevant to Native American descendant communities, effectively leaving remains from other populations in limbo (McGowan & LaRoche, 1996; Ellis, 2000). Another serious complication of NAGPRA is cultural affiliation can be proven using, “…geographical, kinship, biological, archaeological, anthropological, linguistic, oral tradition, or historical evidence or other relevant information or expert opinion” (ibid.). This means in some instances that if a tribe believes that they have affiliation with a particular burial, their claim can be substantiated without biological evidence.

NHPA resulted in the creation of the 59 State Historic Preservation Offices, who oversee the properties on the National Register of Historic Places. Fewer than 1000 cemeteries are currently covered by this legislation, and it is common for forgotten cemeteries to be discovered in the course of construction work (Jervais, 2009; Ubelaker, 2011; Caravajal & Grzybowski, 2013, 2014). Private land is governed by state law, with 18 states having specific laws regarding the administration of burials (Ubelaker, 2011). Few archaeologists and State Historical Preservation Offices have an in-depth comprehension of all burial legislation themselves (Chesky, 2009; Caravajal & Grzybowski, 2013,
The public tends to be even less aware of these laws. Often, potential descendants first hear of the intent to relocate a cemetery in a local newspaper (Saunders, 2014). In many cases, they are surprised to learn that cemeteries can be legally closed and moved at all (Orser, 2002).

In instances where construction interests and television have been criticized by the public, they may often claim truthfully that their activities fall within the letter of the law. The producers of “American Digger” asserted that their host was exercising his “right as an American citizen” to televise his metal detecting exploits. Others have commented that neither “American Digger” nor “Diggers” were “…violating federal and state regulations against unlawful obtainment of antiquities” (Carter, 2012; Kloor, 2012). During the contentious excavation of the La Plaza de Cultura y Artes over a mission cemetery in California, the CEO was quoted as saying, "From the moment we discovered human remains on our site, we have conducted the necessary archaeological excavation in strict accordance with the law…” (Markus, 2011). The city of Waco, likewise, assured the public that it was “…following the codes of the Texas Historic Commission” during the construction of the Ranger Museum (Fleetwood, 2008).

Unfortunately, it is possible for this to be true, while falling short of public and archaeological expectations about how work should be accomplished. Sadly, it is often monetary factors that determine how low these expectations may become. Some errors are relatively innocent. In the case of the show “Diggers” for example, the hosts wrongfully dug on Montana state-owned land, protected by the National Register of Historic Places, because they received erroneous permission from the lessees of the property (French, 2012). Though not involving burials, this highlights the lack of understanding of archaeological law and the confusion which may result. Others are more cavalier. Where the Fenton burial mounds were concerned, the developers stated that they had, “…no legal responsibility to excavate… and could blast through them if [they] wanted to.” (Batz, 2001). Odyssey Marine Exploration, the company responsible for the ship salvaging in the History Channel’s “Treasure Quest”, has been involved in a number of law suits for mischaracterizing circumstances of the shipwrecks which would make salvage allowable (Volkery, 2009; Zorich, 2009; Burfield, 2012). Though the suits have focused on the monetary value of the treasure involved, such sites are also typically graves (Volkery, 2009). “Nazi War Diggers” similarly claimed to be, “…fully compliant with local legal and licensing regimes…” in excavating burials. However, they may have taken advantage of legislative blind-spots in the countries in which they filmed; the legality of their actions is currently undergoing evaluation (Brockman, 2014).
Similar confusion or duplicity may arise when cemeteries are encountered in the course of construction. Three recent examples have been seen in Texas and California. Two are the aforementioned Texas Rangers’ Museum in Waco, which disturbed the historic First Municipal Cemetery during its expansion, and the discovery of mission burials under the La Plaza Cultural Arts Centre constructions site in California (Chesky, 2009; Cooper, 2011; Leonard, 1999, 2012). Finally, several years earlier in Bolsa Chica, California, ancient Native American burials were discovered on private land earmarked for housing development (Haldane, 1994; Alexander, 2008; Barboza, 2008). At this project, as well as La Plaza de Cultura y Artes, it is unclear whether the coroner was contacted upon discovery of remains in accordance with California state law (Alexander, 2008; Cooper, 2011). While this was a potential legal gaffe, at the time construction began at Bolsa Chica, state law did not “…expressly forbid the destruction of Native American cemeteries” and NAGPRA was not yet in effect (Haldane, 1994). The word ‘cemetery’ itself derives its specific definition in English law to distinguish it from earlier churchyard burials, so it may have been uncertain before NAGPRA whether pre-contact Native interments fit this definition.

In the case of La Plaza and the Texas Rangers Museum, the fact that the site was a ‘dedicated cemetery’, albeit defunct, may have caused confusion about application of the state health code. Texas code dictates that construction cannot take place on a dedicated cemetery, whereas California law states that only remains found outside a dedicated cemetery need to be reported to the coroner (Chesky, 2009; Cooper, 2011). The original Ranger Museum, constructed in the 1970s, may have also built over some burials in a cloudy interaction with the law (Smith, 2008). Perhaps owing to this vagueness, at all three sites the initial Environmental Impact Report either intentionally or accidentally obscured the extent of the archaeological findings (Haldane, 1994; Chesky, 2009; Adelman, 2011; Cooper, 2011). Although it is tempting to imagine that this is oversight owing to unclear legislation, involved parties feel that “…there is considerable pressure on the part of environmental planners to perform the absolute minimum due diligence,” in such cases (Chesky, 2009).

The three projects had different outcomes. At La Plaza, construction plans were altered, and bodies were reburied on site (Leonard, 2012). At Bolsa Chica, the site was excavated, development continued, and the remains were studied (Alexander, 2008; Barboza, 2008). Expansion was permanently halted at the Texas Rangers Museum and the bodies which had been excavated underwent DNA testing (Fleetwood, 2008; Smith, 2008; Collins, 2009; Waco Tribune, 2014). A lawsuit and counter-suit resulted, with American Archaeology Group and the city blaming one another for failing to anticipate the
magnitude of the site and create an adequate work timeline on that basis (KWTX, 2008; Waco Tribune-Herald, 2008). Without allowing sufficient time for initial survey, this is not uncommon: extensive scraping, subsurface testing, and other techniques may be necessary to define the full extent of a cemetery (see Schaper, 2005; McDaniel, 2007). As the project progressed, AAG began to question whether the city had been compliant with state and federal laws (Waco Herald-Tribune, 2009). This project created a discussion of state law regarding burials, confronting many with the fact that statutes were not strong enough to protect similar sites (Chesky, 2009; Jervais, 2009). In all three instances, archaeologists were involved with the project (Fleetwood, 2008; Smith, 2008; Alexander, 2008; Barboza, 2008; Adelman, 2011; Cooper, 2011; Markus, 2011). In two of the cases, archaeologists were removed from the project when they became critical of the methodology demanded of them (KWTX, 2008; Waco Tribune-Herald, 2008; Adelman, 2011).

In general, UK law is more broadly conscious of burial exigencies. However, burial law, frequently meant to deal with cemeteries still in use, is often an unfit regulator for historic cemeteries (Shelbourn, 2010). Confusion arose in the United Kingdom when oversight for burials was transferred to the Ministry of Justice, which published new policy on Burial Law in the 21st Century (White, 2011). Historically, burials in the UK fell under common and Ecclesiastical law which dictated that burials not be removed without legal authority, especially from consecrated ground (White, 2011; Parker Pearson et al., 2011). This was over-ridden by statute law beginning with the Burial Act 1857, the Disused Burial Grounds Act 1884, and its 1981 Amendment. After the 1857 Act, regulating bodies specified prior to issuing licenses that a body removed from a burial ground should experience due care and decency, be screened from the public gaze, be studied by a specialist, and should be retained if important. The Act of 1884 and its Amendment prevent building over a burial ground unless the remains have been removed and cremated or reburied. The Pastoral Measure of 1983 gives further powers to a planning legislation or the Church of England. In Scotland, however, only Common Law applies and Christian burials are almost never intentionally exhumed. It remains a common-law offense to disturb a burial, no matter what age, in England, Wales, and Scotland. To do so in a Christian burial ground requires a Ministry of Justice Exhumation license if the intent is not to rebury the remains (White, 2011). In order to obtain one “good and proper reason” must be demonstrated.

A “2nd Guidance to the new policy on Burial Law in the 21st Century” meant that a Section 25 License was no longer needed to exhume remains from active cemeteries (Sayer, 2012). Archaeological work, however, was complicated because of new uncertainties regarding permitting, and the retention of
remains for study. In some instances, the new laws seemed to imply that even very ancient pagan remains in University collections might have to be reburied immediately in Christian ground (ibid., Parker Pearson et al., 2011). This was clarified to some extent in 2008, when the Coroner’s Unit issued a statement known as “Burial Law and Archaeology” (White, 2011). Because of these increasingly standardized laws, it is more complicated for British contractors to avoid archaeological excavation when the public advocate for it. One notable exception was the excavation of St. Pancras station in London. Archaeologists were briefly removed from the project when the contractor became impatient with the timescale of work (Sayer, 2012). This decision was overturned and a compromise was reached owing to public and professional outcry.

Perhaps because of genetic continuity and the venerable place archaeology holds in the culture, in the UK, archaeology is usually considered by the public to be a delicate means of removing the dead (Shelbourn, 2010; Parker Pearson et al., 2011). Exhumation is also legal and widely used (Townsend, 2012). It is more common when ties to the living have been severed and no great historical importance is assigned to the remains (ibid.). Such descendant-less exhumation may be seen as acceptable when they public are not confronted with the realities of the techniques being used. Burial archaeologists are rarely demonized unless their work is seen as being conspiratorial against a popular political cause, like the destruction of an old tree as part of a cemetery excavation in Oxfordshire, or the analysis of a Devonshire cemetery of uncertain ethnic origins (Norton, 2008; Sayer, 2012).

Despite increasing activism in US cemetery legislation and the desire to create more uniform standards, there is an awareness that increased regulation is likely to conflict with legislation regarding private property rights. This area is thought to be sacrosanct in US law (Chesky, 2009; Jervais, 2009). Human remains are unique in that they skirt the boundary between “person” and “object” (McGowan & LaRoche, 1996). The remains of the dead are immune to legal possession; thus, stripping the living of their literal property rights in regard to burials is uncommon. The Chicago O’Hare airport extension is an interesting example of this as the city had the cemetery land condemned against the will of the church that owned it (Daily Mail, 2011). Despite the fact that remains cannot be owned, they may engender a strong sense of ownership by the living, whether literally related or not (Ubelaker, 2011; White, 2011). Just as the private ownership of the land may be trumped by the desire to develop, the desire of outside parties to protect ‘their dead’ on someone else’s land may change the outcome of planned development. The great tension this creates between the needs of developers, and the need to appear sensitive to the concerns of the living, often leaves archaeologists caught in the middle (Shelbourn, 2010).
Swept Under the Tarp; Dogged Developers, Archaeological Middle-Men, and Public Sensibilities:

Amidst the general confusion about archaeological practice lies the often-unhelpful influence of corporate interest. Large companies and public infrastructure projects are among the most likely to encounter human remains (Batz, 2001; Gonser, 2004; Sturgis, 2009). Perhaps arising from modern qualms over unchecked capitalism, there is a frequent concern that developers, and by extension archaeologists, have something to hide. Whether employing exhumations contractors or archaeologists, the general response to this fear has been to hide more effectively. During the removal of burials at the Sheffield Cathedral for the construction of a new tram stop, office workers were outraged to see exhumation contractors storing remains in black trash bags from their high rise. The use of trash bags was not against procedure and is in fact, common (Sayer, 2012). The company was cited for offending public sensibilities by letting people witness it. This was addressed by erecting a tarp over the digs. At a similar non-archaeological exhumation beneath Manchester’s Victoria Station, the public was assured that screens would prevent the community from viewing the diggings (Bainbridge, 2014). The project continued with little objection. This “out of sight, out of mind” practice often is effective in preventing passers-by from being confronted with the idea that the dead are even among them.

Archaeologists have been critical of this lack of transparency, arguing that the public on the whole has consistently expressed an interest in the excavation and display of human remains of all periods (Parker Pearson, et al.; 2014). Indeed, where known or suspected descendants come into the equation, attempts to hide excavations from the public gaze have often backfired. Descendants at Chicago O’Hare were concerned by the quality of archaeological excavation because it was hidden from them, while exhumation could be watched (Hilkevich, 2010; Daily Mail, 2011). During the dig of the suspected almshouse burials near the African Burial Ground, New York, the erection of a tarp created suspicion rather than allaying public fears (Anderson, 2000). This incident was particularly heated because of the initial furore over the previous excavation at the African Burial Ground, which resulted when a mechanical digger was captured on film damaging burials (Sayer, 2012). In another instance, the complete insufficiency of a tarp as a protective measure was made plain when a femur was removed by a looter from a stone burial cist at construction over the Fenton Mounds in Missouri (Batz, 2001). Rather than being responsive to inquiries, Wal-Mart retorted, “We built a 1.3 million square foot shopping center that's the neatest thing ever built in St. Louis; it's the biggest. I don't like this line of questioning.” (Batz, 2001). Similarly, a Wal-Mart representative in Honolulu expressed “disappointment” that the descendants of disturbed burials were “…using legal tactics to prolong the process…” that was stalling
construction over the remains of their ancestors (Leone, 2004). At Bolsa Chica, the developer assured
the public that they had, “… designed the most sensitive plan that can possibly be designed.” and that it
was, “…not likely that a redesign [would] be necessary” (Haldane, 1994). A decade and many redesigns
later, archaeologists removed 174 sets of human remains from the site (Alexander, 2008; Barboza, 2008).
As a result, archaeologists who were involved in these sorts of projects have been absorbed into the
negative press generated by the insensitivity and sometimes, dishonesty, of the contractor.

Indeed, cultural resource management is often tantamount to salvage archaeology. McKinley
found in a UK survey that 80% of respondents had excavated human remains only within the context of
rescue digs (Shelbourn, 2010). Many included over 100 burials, and many encountered burials where
none had been anticipated. Other projects still involve archaeological monitors, who simply watch
equipment to make sure it causes a minimum of destruction. In these instances, analysis is often not
performed at all. In both cases, formal widely distributed publication is rare. Development may be so
complicated that builders will avoid a cemetery where possible, developing elsewhere, or leaving the
cemetery as an island in a sea of construction (Schaper, 2005; Downes, 2011). When this is not possible,
the three avenues available are to obscure the findings or to opt for either archaeological excavation or
exhumation.

The conflict between temporal and monetary constraints on archaeologists working for cultural
resource management firms is well recognized (McGowan & LaRoche, 1996). In such unideal
circumstances, “archaeological ethics are stifled for good politics” (Anderson, 2001). In the case of the
almshouse adjacent to the African Burying Ground, the osteologist was compelled to perform in situ
analysis of the human remains, rather than excavating and conducting thorough analysis in a lab
(Anderson, 2001). When remains were excavated from a possible slave cemetery in the Richland
Chambers Reservoir, physical anthropologists were prohibited from keeping remains overnight, and so
had to complete excavation and analysis within the same day (Brown, 2012). At this project, La Plaza,
and the Texas Rangers Museum, archaeologists left the project rather than compromise their ethics.

By contrast, exhumations may go almost unnoticed, due to the speed of the work and the
intentional lack of publicity surrounding them. When construction workers building a new IKEA
discovered human remains in the Old Rock Spring Cemetery in St. Louis, Missouri, they were removed
by the end of the day. A single paragraph in the local news was devoted to their removal (Williams,
2014). An exhumation of hundreds of sets of remains beneath Manchester Victoria station in the UK
received a similarly small amount of press: exhumation was well under way by the time any account of it
arose in the newspaper (Bainbridge, 2014). In the case of the Congregation People of Righteousness cemetery in Yonkers, outrage was only provoked when a family returned, searching for the remains of their relatives (Weiss, 2004; Wakin, 2004).

Frequently, exhumations only reach the news when they go tragically wrong. One such case occurred in Manchester, under the headline “Apology Over Bones in Tip.” (Manchester Evening News, 2004). The contractor apologized, though little context and no explanation was provided for how the bones came to be in the dumpster. Others involve more recently exhumed remains such as the case of a Greenwood, Indiana family whose relative tumbled from an inappropriately exhumed casket, or a cut-rate California cemetery that was cutting into in-perpetuity plots to make room for surplus burials contrary to the original contracting arrangement (Leonard, 1999; Fox News, 2008). Although many examples of archaeological blunders can be found, these exhumation incidents seem even more dramatic in their insensitivity. Perhaps the most shocking thing about them is the brevity of their coverage, as though they are the exception rather than minor outliers in an already-destructive practice.

**Whose Dead? Whose Respect?:**

In the continuing struggle for socio-political control of the dead, the choice to exhume or excavate remains a charged issue. NAGPRA resulted from a colonial history of burial excavation that dates back to Thomas Jefferson (Ubelaker, 2011). However other groups in the US and UK have tensions with archaeology that have come to the surface in different ways. Control over African American and Afro-British remains is an evolving issue (Eberwine, 2005). During the 1990s, the excavation of New York City’s African Burying Ground sparked a massive controversy in the US (Harrington, 1993; Anderson, 2001). Several years later, an excavation at Rapparee Cove, Devon fomented dissent in the UK (O’Brien, 2001; Morris & Constable, 2007). In the case of the African Burying Ground, shoddy excavation techniques and the employment of non-professionals became a point of contention that allowed a predominantly African-American institution to take control of the excavation. While some felt that the excavation of these dead was literally “releasing evil”, their concern was primarily the fear that others would interpret the site from a non-African-American perspective (Harrington, 1993; Anderson, 2000; Orser, 2002; Sayer, 2012).

This is interesting, in light of the fact that the adjacent, and perhaps overlapping, site was known to have contained the graves of non-African paupers (Anderson, 2000). One of the primary objectives in controlling the project was to prevent analysis from denying the history of slavery in New York.
However, somewhat ironically, the original name of the burial ground was changed from the “Negroes Burying Ground” to the “African Burying Ground” (Sayer, 2012). The politicized research goal of detecting “modes of resistance” to slavery in the archaeological record was also incorporated into the project (Eberwine, 2005). In 1998, archaeologists from Parsons Engineering began further excavations to make way for improvements to New York’s City Hall (Anderson, 2000). The remains encountered during this project were believed to be almshouse burials from osteological evidence and historical context. Yet the African community felt the baseline osteological analysis being done by the Smithsonian was insufficient, and DNA analysis should be conducted to prove ethnicity (ibid.). In other words, the professional judgment of those at the Smithsonian was deemed to be somehow biased against discovering evidence in favor of African-American ancestry in the population.

This view is echoed at the Waco Texas Rangers Museum. Almost half of the remains at the site were determined to be of non-African affiliation, yet there remained a sense that non-African-American archaeologists could not properly understand such burials (ibid.). Noting that his firm was the “only African-American owned archaeology firm in the US”, Fred McGhee of Fred L. McGhee and Associates criticized the work of AAG, the firm hired to oversee the project, as “wanton desecration” for unspecified reasons (Chesky, 2009). Rapparee Cove in the UK evoked a similar response. Excavated in the 1990s as a suspected ‘slave cemetery’ associated with a shipwreck, stable isotope analysis revealed that the remains were local to France or Devonshire (O’Brien, 2001). Members of the African Repatriation Movement have advocated for more testing, hoping to refute the findings (Morris & Constable, 2007; Sayer, 2012). Unlike the African Burying Ground, the feelings of secrecy and public obfuscation surrounding the excavation persisted for so long that, “… it no longer matter[ed] whether Rapparee Cove was a slave cemetery or not – it will always be surrounded by questions and suspicions.” (Sayer, 2012: 78). In all instances, the truth about the dead was not at issue. Instead, they became a vehicle for a special interest group to tell their own story about the past.

Despite the political foibles of the African Burying Ground excavation, many positive results were achieved for archaeology. Future excavators learned that consulting interested parties prior to projects can do much to alleviate tension and increase resources through collaboration. In numerous other cases of African-descent cemeteries, discord has been avoided by involving special interest groups (Sayer, 2012). Because of these outcomes, archaeology has often taken on a positive quality in the minds of African-American communities, who see it as a tool to engage with a history that was stolen by slavery and segregation (Eberwine, 2005). Among Native Americans, mixed results have been achieved.
While some tribes encourage the analysis of their dead, it is more frequently viewed as a continuation of colonial oppression that is in conflict with their beliefs about the afterlife.

Such cultural beliefs may make a group more resistant to study, despite their feelings about archaeology. Some tribes remain eager to engage with archaeologists, particularly at the Federal level, where they have some input on most projects involving items of cultural patrimony (Ellis, 2000; Eberwine, 2005). At the state level, however, their enthusiasm can be dampened by underhanded development tactics that neglect their beliefs in the name of western ‘progress’ (Batz, 2001; Leone, 2004). Though NAGPRA only covers Native Remains on Federal Land, the spectre of the dissent that lead to the law’s creation often gives weight to the protests of Native communities when excavation is threatened on private land (Haldane, 1994). During the proposed construction of the La Plaza, for example, the combined efforts of the Gabrieleno tribe and members of the Catholic Archdiocese were able to halt excavations (Adelman, 2011; Markus, 2011; Cooper, 2011). This was partially possible because of legal missteps, and because the project archaeologists were so outraged by the methods employed (Adelman, 2011; Cooper, 2011). In other instances, even the threat of bad publicity has not prevented the removal of Native burials from private land. This was the case at the Wal-Mart construction projects in Missouri and Hawaii, and the housing development project in Bolsa Chica (Batz, 2001; Leone, 2004; Alexander, 2008; Barboza, 2008).

Other cultural-ethnic groups have similar feelings. During the excavation of a cemetery at Jewbury the Chief Rabbi of York and the Bet Din initially declared that excavation could proceed unhindered when it was believed that the graves were not of Jewish origin (Brothwell, 1987; Sayer, 2012). This belief arose from the use of coffin nails, an unknown practice among Jewish groups. When others within the English Jewish community dissented, the Chief Rabbi of York rescinded his decision and halted analysis of around 500 skeletons which had already been excavated, to spare the remains “which had once borne the spark of the divine image” from desecration (ibid.). These cases raise many questions. Do the non-marginalized dead bear no inherent importance, no image of the divine, and no ability to release evil, or is the question whose business it is to protect the sanctity of particular remains? How can one justify refusal to analyze when it was the Jewish community’s uncertainty about their own historical practices which led to their initial conclusion that the cemetery could not be Jewish?

In each of these cases, concern for the dead has not been an overarching ethos, but rather protectiveness of those who are perceived as someone’s dead. The response of non-marginalized Caucasian communities is less uniform. It is worth considering to what extent their dead are moved at
all. According to some, major European-descent historical sites in the US, such as Jamestown are “off limits” (McGowan & LaRoche, 1996). It is also possible that largely white, privately owned cemeteries are more likely to be preserved in perpetuity, whereas slave and Native burial grounds may exist on private land which is no longer in the hands of the descendants (see Brown, 2012; Saunders, 2014). Alternately, perhaps those who have prospered take a more academic interest in their history, especially if it restores less fortunate ancestors to a better place. This may be seen with a recent relocation of Irish Famine refugee graves, and the excavation of the railroad workers of Duffy’s Cut (Tucker, 2010; Barry, 2013; Ishayik, 2014). Finally, it is possible that when predominantly Caucasian cemeteries are moved, the more affluent are able to use private exhumation contractors. As the case of Chicago O’Hare illustrates, this may be seen as a way of controlling an uncontrollable situation, in which archaeologists are the villains.

Archaeologists themselves are an interest group, who have likened the reburial of human remains to burning books (McGowan & LaRoche, 1996). They have a strong argument in favor of retention of remains in that scientific research cannot be substantiated without replication and peer review. However, it is equally possible for them to endorse their agenda of research, at the expense of the sensibilities of other parties (Sayer, 2012). Dissenting voices are common within special interest groups. Dissent of archaeologists among themselves has a detrimental effect on the progress achieved through years of hard work and error. In the case of the Waco Texas Rangers Museum and the African Burying Ground, African-American archaeologists called the work of other archaeologists into question, not necessarily for its quality, but for the ethnicity and assumed biases of the excavators. This detracts from the reputation of archaeology in the same way that metal detectorists and amateurs do by equating their ‘research’ with that of professionals. The attitude of an ‘acceptable level of damage’ to human remains during study may make the public even more averse to archaeology if the benefits are not adequately promoted (McGowan & LaRoche, 1996; APABE, 2013). More difficult is the unavoidable possibility of reaching an interpretation that is distasteful to another party. In cases such as the African Burying Ground and Rapparee Cove, the failure of archaeologists to satisfactorily anticipate the concerns of the public resulted in preventable friction. On the other hand, many applications of NAGPRA, the Rapparee Cove excavation, and the Jewbury burials illustrate the hazards of creating a false sense of continuity between a past culture and a living one.

On one end of this spectrum are the Jewbury Jews. Here, the world missed out on fascinating knowledge of Medieval Jewish practices in England because of the beliefs of a modern descendant group
(Brothwell, 1987; Sayer, 2012). This is unfortunate for science, but protecting the sensitivities of the modern community is certainly a cause which engenders sympathy. In the famous case of Kennewick Man, archaeologists were able to secure the study of remains, which, as recent analysis revealed, had genetic association with the tribes who hoped to prevent their study (Rasmussen et al., 2015). This was only discovered after arduous research with conflicting results (Owsley & Jantz, 2014; Rasmussen et al., 2015). Had Kennewick Man been reburied without study, and had he no affiliation with the tribes that claimed him, it would have been a kind of theft from science and from his true descendants. Conversely, the new results show that the research has been a misappropriation by archaeologists. Yet ironically without their diligent scholarship, the truth would have stayed an open question forever.

Going a step further, continued attempts have been made to reclaim burials at Rapparee Cove, which DNA has shown to be unrelated to the claimants. In this case, the possible descendants advocated for study. Only when their agenda was not upheld, did they become critical of the methods employed (O’Brien, 2001; Morris & Constable, 2007; Sayer, 2012). An even more extreme example is that of Neopagan Druids in Britain, who have called for reburials ranging from bog bodies to cremated remains at Stonehenge. This is based on a claimed kinship to their way of life, despite demonstrably different beliefs between the groups (Sayer, 2012; Parker Pearson et al., 2013). Archaeology is the filter which separates the voices that legitimately call for respect, from those that call for skewed or even patently false interpretations. Yet, like any interest group, in pursuit of these truths, archaeologists are subject to their own biases, limitations, and failures.

**CONCLUSIONS:**

Public mistrust of archaeology is not without basis. A combination of historic baggage; stereotypes; confusing burial law; and corporate pressure and insensitivity has created an environment in which the public is right to be critical of the relocation of their dead. Compounding any professional failings is the uneven publicity surrounding cemetery relocations, which plays a large role in public perception of burial archaeology and the misunderstandings which arise during projects. Archaeologists have a duty to take steps to ameliorate both of these concerns. These include being sensitive to the apprehensions of interest groups and descendants, even where their claims seem spurious. Though it is impossible to satisfy all parties in all cases, even the simple act of acknowledgement may improve the standing of archaeology in the eyes of the public. More difficult is changing the burial law that allows cemeteries to be moved using destructive techniques. As long as it is possible for exhumations to take place with mechanical diggers, archaeologists will be pressured to bring their methods to closer to this
low standard to be financially viable. Finally, and perhaps most challenging of all: it is not enough to consult and publish. Archaeologists much engage and involve the general public, to make them aware of what archaeology is, and what it is not.

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Chapter 12: Shouting to Wake the Dead; Is it time for a Historic Graves Protection Act?

“Show me your burial grounds, and I will show you a measure of the civility of the community.”
-Benjamin Franklin

INTRODUCTION:

As the previous paper illustrates, the public response to burial clearance by archaeologists is overwhelmingly negative, if interest groups feel left in the dark or ignored. This is understandable in light of the paternalistic history or archaeology (Trope, 2013; Fine-Dare, 2000), the public’s feeling that archaeology is for entertainment purposes (Acherson, 2004; McDavid, 2004), and the feeling that the Western dead are meant to rest in peace (Trope & Echo Hawk, 2000; Sayer, 2012). It is possible also, that with increasing backlash against corporate oppression at the expense of the “average joe”, an element of anti-capitalist sentiment is turning most citizens into a new disenfranchised minority with regard to corporate expansion projects. While this is far from a comprehensive understanding of public views, it provides a much-needed glimpse into this arena.

In arguing for NAGPRA, it has been stated enviously that the remains of white individuals are immediately reburied where they are encountered (Mihesuah, 2000), yet as the previous paper illustrates, “quick reburial” is not tantamount to respect. Others perceive reluctance to disturb European burials and “strict” protection of recognized, mostly “white” cemeteries in all fifty states (McGowan & LaRoche, 1996; Klesert & Powell, 2000; Trope & Echo-Hawk, 2000), not realizing the number of abandoned, forgotten, or unmarked cemeteries of non-Native ethnicity which have little to no protection under the law. Some Native groups have suggested that famous historical white burials should be dug up to “see how they were doing at the time of death” and even submitted grant proposals to excavate pioneer burials in order to mirror the injustice they have experienced (Fine-Dare, 2002). Although the hurt that gives rise to such actions is more than understandable, the goal should not be to shift burial desecration onto another group to prove a point.

Native scholars in the NAGPRA debate have been rightly critical of archaeological insults that Natives “can't possibly understand” what archaeologists are doing, and by extension, are not entitled to object to their research (Mihesuah, 2000). Descendant groups are certainly entitled to object to archaeology, and indeed to any disturbance of the dead (Riding In, 2000). However, it is hard to take objections as seriously when Native groups either facetiously or genuinely act as though they do not understand what they are objecting to: namely that archaeologists are merely trying to see “how people
were doing” at the time of death. This is a perfect illustration of what “the public” expects from archaeology, and how archaeologists are failing to provide it.

Riding In has stated flatly that Indians do not need archaeology (2000). Mihesuah has argued that archaeology “...has not been used to decrease alcoholism or suicide rates, nor has it influenced legislative bodies to return tribal lands or to recognize the sad fact that Indians are still stereotyped, ridiculed, and looked upon as novelties.” (2000, p 97). This is a tall order for a largely descriptive science. Archaeologists may increasingly participate in public’s need for archaeology to entertain (Merriman 2004 b, c; Copeland, 2004; Acherson, 2004; McDavid, 2004). Yet as the above paper illustrates, it is difficult for archaeologists to successfully walk the tightrope of simple showmanship without severely compromising their ethics. How much more would this be true if archaeology were to raise its voice in support of native land claims? Or to take on the responsibility of mitigating the First Nations’ high suicide rates with an archaeological narrative of a return to a more romantic past: a narrative that many Natives already reject as an outdated stereotype or a usurpation by science (Mihesuah, 2000; Riding In, 2000)? Ironically, the search for “truths” to support nationalistic and racial agendas, albeit Eurocentric ones, is what created so much animosity between Native groups and archaeologists in the first place (Buikstra, 2006; Ubelaker, 2006). This tradition of supporting agendas is one archaeologists ought to move away from (Meighan, 2000), even though it is part of what “the public” demands of archaeology (Mihesuah, 2000).

There is no tidy panacea for the quandary of how to make archaeology relevant without allowing its interpretations and their consequences to fall “into the wrong hands” so to speak. Mallouf counters “Do [Native groups] honestly believe that scientific findings, which have proven so important in dispelling the prejudiced European conceptions of the ‘barbarous savage’, are somehow deleterious to their well-being?” (2000, p 71). The dispelling change of which Mallouf speaks was not a revelation based on a single discovery or dramatic act of archaeological activism. Rather, it was the result of decades of diligent archaeological work accompanied by gradual cultural evolution, including Native self-advocacy such as NAGPRA. As Meighan states, it is not ethical for archaeologists to omit research in order to avoid reaching conclusions which might be upsetting (2000). Indeed, to do so is grounds for expulsion from the Society for American Archaeology (Klesert & Powell, 2000). However, the first step toward making archaeology relevant is to engage with descendant communities and interested parties to find out what questions or issues within the bounds of professional ethics, archaeology can shed light on for them.
While it is probably not possible for a non-minority to comprehend the hurt and injustice that a historically disenfranchised group must feel whenever their identity is further impinged upon, it is time to acknowledge that the American public has all been somewhat disenfranchised in the control of their dead. Archaeologists have tended to state that European-descent groups are less likely to see their dead disturbed (Baugher & Veit, 2014), yet the previous two papers illustrate a number of incidences in which they have been, often receiving less consideration as measured by careful study and corporate forbearance than their minority counterparts. It is also worth considering that while activism has changed the course of a number of African American, Afro-British, Jewish, and other minority excavations, none of these groups maintain the same rights to their dead that Native groups are provided by NAGPRA (Ubelaker, 2011). A key component of NAGPRA, the issue of the display and retention of human remains for study, has almost certainly affected minority populations more than European (Mihesuah, 2000; Luby & Nelson, 2008). This facet is complicated enough to be a separate issue and will largely be omitted from the following discussion, as museum displays more rarely include non-Native remains in the United States.

I propose that there are several contributing factors to the perception that non-Native dead are unthreatened in the United States. 1) Rather than being more respected, historical burials, especially those of European-descent groups, are considered to be too boring for study. 2) Unless a group is likely to “cause trouble” for developers, it is easier to quickly relocate the burials without revealing the possibility that there is a more delicate option for their removal. 3) Because Euro-descent individuals more often trace their genealogies through direct bloodlines than a broader sense of cultural affiliation, individuals are less likely to be confronted with the threatened relocation of someone they consider a relative; the resulting perception that burial relocation is surprising and rare, obscures the actual frequency of the practice. 4) A similar ignorance of burial relocation may be seen among other minority religious or ethnic groups, whose identity may be collectivist, but whose activism and awareness may be more locally focused.

Behind all these factors that amount to the supposed avoidance of non-Native burials is a central question: what is a cultural identity anyway, and how can we prove it? As noted in the previous pages, in addition to inter-tribal conflict, Native groups and other vocal minorities have sometimes minimized the right of possession of other groups. Hemmenway speaks of feeling shock and anger during an incident in which a Michigan museum curator tried to prevent the repatriation of remains with mixed Odawa and European ancestry (2013). Hemmenway’s default assumption, though perhaps true, was not that there
might be European descendants affiliated with the remains who had an equally legitimate claim to them, or that the individual in question might have identified more as European than Odawa, but that the museum was simply being disrespectful and antagonistic. Dumont, in the same volume, argues rabidly that archaeological “objectivity” is merely a belief among and equal to others (2013). While it is legitimate to ask whether “science” or “belief” is more important in certain contexts, science is not a belief in the same sense as the cultural history that Dumont espouses, but a method of finding evidence which may then be applied to support or deny beliefs depending on what it reveals (Landau & Gentry Steele, 2000; Meighan, 2000).

There is certainly a “truth” about any individual who lived, though it may be too complex to ever fully understand or prove. An individual undeniably has (or had) a distinct lineage, a character, a belief system, and a history. For example, the present author is an American by birth, who has traveled to many different countries, and lived in dozens of US localities. She has large measures of Irish, Scottish, English, and lesser amounts of German, French, Spanish, and Dutch ancestry. These ancestors were Quaker, Puritan, Huguenot, and Catholic; and though the author was raised at various points in the Catholic, Presbyterian, and Baptist churches, she has studied Judaism, Diné, Sufiism, and Buddhism, as well as science. It would be manifestly incongruous for a future African-American group (with whom the author to her knowledge shares neither close descendancy nor distinct cultural behaviors or beliefs) to claim the author as an ancestor, yet it would be equally incompatible for a white supremacist group, a Mormon group, or a conservative Republican group to claim affiliation with the author on the basis that she is undeniably white, lived for many years in Mormon country, and was raised in a family that is largely Republican. Despite demonstrable similarities of race, locality, and origin, the beliefs of such groups are in fact opposite to the “truth” about the author. Even the possession of the remains of the author by direct descendants might be unwelcome, depending on how their relationship to the deceased manifested itself and how similar their beliefs were. Other associations such as with an Irish-American group would not necessarily be unwished, despite only sharing one tangential aspect of the character of the deceased.

This comes to light even in Native concepts of identity. Someone who is less than half-blood Ute, for example, even if raised in the Ute tradition on the Ute reservation all their lives is not legally considered a Ute by the tribe and will never be enfranchised legally as a tribal member (Fine-Dare, 2002). Would the earthly remains of such a person, in death, become the property of the tribe to which they belonged, yet which on some level rejected them? This sort of reverse racism is echoed by Riding
In, who speaks of “wannabes” and “pretend Indians” who in his view abdicate their biological or cultural “Indian-ness” merely by sympathizing with archaeological aims (2000). Deloria dismisses outsiders interested in the practice of Native religions, while claiming with more than a whiff of elitism that Native religions are “…perhaps the only consistent religious groups in American Society…” (2000, p 178). Both of these individuals clearly have strong opinions of what constitutes “Indian-ness”. However, their perspective would certainly clash with the equally legitimate self-image of the so-called “wannabes”, the “pretend Indians”, the converted practitioners of the Church of the Native Americans, and the well-meaning anthropologists that they criticize.

While it is also possible for archaeologists to purposefully obscure the “truth” of individual histories to protect their own research agendas, in most cases, any perceived obfuscation is more likely the result of their own limitations. There is nothing wrong with a living group claiming kinship with shared aspects of an individual’s history, provided the differences between the two are not so substantial as to result in the obliteration of important aspects of the ancestor or ancestor group’s character or wishes. It is important, furthermore, that living groups feel respected and enfranchised (Goldstein & Kintigh, 2000; Klesert & Powell, 2000; Sayer, 2012). However, a desire to have origin stories and beliefs respected on word alone cuts both ways. If for example, a Native group “feels” and has a tradition that a cemetery full of missionized Natives were unwilling converts who would want traditional reburial, can they truly contradict a Catholic “feeling” and oral tradition that the Indians were enthusiastic converts who shunned their Native origins without further objective evidence? This example is of course hyperbolical: because of historical and archaeological evidence, alongside the oral traditions, the travesty of missionization is well-established (Stojanowski et al., 2002). However, it shows that if belief alone is substituted for evidence, where beliefs differ and amicable compromise cannot be achieved, one party will win, or no one will. This is keenly felt in the observation that “balance” has not been attained by NAGPRA (Keller O’Loughlin, 2013).

This balance cannot and will not be obtained until all groups have a claim to their ancestral dead. Though all voices should be weighed in the debate of “whose dead?”, archaeologists are uniquely suited to wield the scales through the medium of scientific inquiry. Yet if archaeologists are compelled to compromise their professional ethics either to cater to developers or to a minority group with a disproportionate amount of power in the debate, then the power of archaeology to act as arbiter is moot. The ability to balance archaeological ethics with practice can only be achieved when all groups receive equal protection under the law.
Shouting to Wake the Dead; Is it time for a Historic Graves Protection Act?

This paper has been submitted for consideration as a talk at World Archaeological Congress, Kyoto

ABSTRACT:
As many as 300,000 abandoned historic cemeteries may exist in the United States today, yet as few as 0.4% of these are protected from disturbance by listing on the National Register of Historic Places. While NAGPRA also protects Native Burial sites on public land, the remainder of ancestral dead, including Natives and non-Natives alike, are vulnerable to exhumation. Even the archaeological excavation of such cemeteries may produce substandard results because of uneven state regulations governing the funding, time, expertise, and publication required in archaeological projects. This article analyzes the patchwork of state laws currently protecting historic burials in the United States. A stronger blanket federal law is needed in the United States to enfranchise all groups in the protection of their dead, and to raise archaeological standards where historic burials are concerned.

INTRODUCTION:
Since the advent of the Native American Protection and Repatriation Act over twenty years ago, Native groups have secured unprecedented access to the remains of their ancestors long held in museums. They have also enjoyed unparalleled input into the future of federally funded excavations that threaten Native burials. Although the reception of NAGPRA has been emotionally fraught, and complicated in its execution (see Fine-Dare; Miheusah (ed.), 2000; Chari & Lavallee (eds.), 2013), the law is now firmly entrenched in the day to day practice of American archaeology. While it remains a work in progress, archaeological excavations on public lands or those using Federal funding are now accustomed to integrating the practices of NAGPRA.

Although NAGPRA was enacted in response to generations of patriarchal scientific injustice, the law has ironically left the dead of Native groups as the only ethnic dead in the United States that have specific federal protection (Ubelaker, 2011; Batillo, 2012). Effectively, the forgotten burial places of all other ethnic groups, and indeed most burials on private land are left vulnerable to overbuilding, destructive exhumation, and removing the power of descendants to participate in such decision-making (ibid.; Bell, 1996; Chesky, 2009; Jervais, 2009). An unknown number of abandoned or disused historic cemeteries exist in the United States. A 1998 Task Force on Abandoned and Neglected Cemeteries in the state of Florida found that some counties had over one-hundred such sites (Florida Department of State, 2016). If this number was extrapolated, it could mean as many as 314,300 abandoned cemeteries in the 3,143 counties and county-equivalents of the United States. Such cemeteries, especially when completely forgotten, are highly vulnerable to accidental disturbance during subterranean construction projects (Robinson, 1996; Batillo, 2012; Baugher & Veit, 2014).
For the Record: What are the standards for archaeological recordation of historic cemeteries?

Currently, there are no definitive guidelines for the recordation of historic cemeteries in the US. However, professional archaeologists within the United States are constrained by the standards of such organizations as the Register of Professional Archaeologists (2016), and the ethics guidelines of professional associations such as the Society for American Archaeology (Klesert & Powell, 2000). In general, the basic tenant of “preserving by record” that has been more clearly articulated for archaeological practice surrounding historic cemeteries in the United Kingdom holds true in the United States (King, 1983; English Heritage, 2004, 2005; Mays et al., 2015): as their experiments can never be truly repeated, archaeologists have a duty to record and describe their findings in such a way that future researchers have a clear picture of the methods they used, the results they obtained, and the context they destroyed (Renfrew & Bahn, 2012). The basic steps that hold true for other sites hold true for archaeological cemeteries: features and finds should be thoroughly measured, drawn, photographed, and described, artifacts and remains should be analyzed by a competent person (ibid. Mays et al., 2015). In the case of historic cemeteries, this means more specifically employing the types of surface recordation techniques described by Mytum (2000); the burial furniture hardware analysis of researchers such as Springate (2014) and Pye (2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013); the general artifact analysis of relevant historic specialties (Heilen, 2012); the osteological recommendations of Ubelaker (1978), Buikstra and Ubelaker (1994), and Brothwell (1981); and of course the basic excavation recording techniques used throughout the profession (Renfrew & Bahn, 2012). Omitting any one of these results in a failure to preserve by record, that is, a failure to conduct archaeological fieldwork to a professional standard (King, 1983). The successful completion of these tasks requires a minimum of four specialties in practice: namely an osteologist, a historian, and a historic artifacts specialist, in addition to field archaeologists familiar with cemeteries.

It has been found that historic cemeteries, especially when discovered unexpectedly during construction, are likely to contain many times the predicted number of burial features (Baugher & Veit, 2014; Cherryson et al., 2012). The testing methods used to delineate graves prior to excavation have included GPR, resistivity, magnetometry, surface scraping, various means subsurface testing, and even the use of cadaver dogs and dowsing rods (Robinson, 1996; Davenport, 2001; Atz & Weaver, 2006; Doolittle & Bellantoni, 2010; Heilen & Grey, 2010a; Matternes et al., 2012 a). However, none of these has proven to be reliable at consistently identifying all burials before excavation begins.
Cemeteries are by their nature sites with two unique loci. The first of these is at the surface. Here, the living are known to conduct burial ceremonies, visit and maintain graves, participate in religious and social functions associated with churchyards, attend picnics, graze animals, and re-landscape and repurpose the space for alternate functions (Robinson, 1996; Cox (ed.), 1998; Blakey & Rankin-Hill, 2009; Heilen & Grey, 2010 a-e; Cherryson *et al*., 2012; Baugher & Veit, 2014). At this level, each burial is a feature which may come complete with a headstone, footstones, fences, grave offerings, plants, landscaping, evidence of unrelated social activities, and a unique soil profile (Robinson, 1996; Mytum, 2000; Baugher & Veit, 2014). The second of these loci is at the level of burials, with each likely to be a data-rich feature (Heilen, 2012; Mays *et al*., 2015; Pye 2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013). Furthermore, the composition of a forgotten cemetery may be highly unpredictable. They may be used solely by a specific subset of the population, for example, a slave community or a Quaker congregation. Alternately, they may unify individuals from all walks of life, including mixed races, mixed cultures, families, migrant workers, soldiers, different economic classes, and various religious and folk traditions (see Heilen & Grey, 2010 a-e; Heilen, 2012). This makes historic cemeteries unusually complicated archaeological sites.

Perhaps because of the complexity of such sites and the amount of time require to record them, research suggests that grave shafts are often not treated like archaeological features in the same way that a Medieval ditch would be (Murphy, present volume). That is, spatial measurements are either not taken in the first place, or are not presented. Often, unless conspicuous headstones are present, the surface and the deposits at the top of the grave shaft are scarcely treated as a unique locus at all (*ibid*.). The same is true of the analysis of historic artifacts and osteological remains. Even an experienced general field archaeologist does not have the skill set necessary to fully record human remains: thorough pictures, descriptions, and general measurements are no substitute (Ubelaker, 1978; Brothwell, 1981; Buikstra & Ubelaker, 1994; May *et al*., 2015). Increasingly, it is common to forego the illustration or photography of remains within burial features (Murphy, present volume). This is frequently justified as an act of respect. In addition to preventing the informed study of taphonomic change (Brickley & McKinley, 2004; Duday, 2006, 2009), this lack of recordation renders the thorough analysis of remains all the more vital.

The same is true of historic artifacts. Objects found in a burial may include various types of lumber, hardware, coffin furniture, embalmer’s effects, clothing, non-clothing fabrics, pins, toys, coins, jewelry, religious items, crockery, toiletries, medicines, prostheses, tools, bullets, food items, luxury items like tobacco, and myriad personal effects (Heilen & Grey 2010 a-e; Heilen, 2012; Matternes *et al*.,
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2012; Blakey & Rankin-Hill, 2009; Springate, 2014; Pye, 2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013). An archaeologist without in-depth of experience with the diverse material culture of historic burial, and perhaps a cultural understanding of the religious or folk-lore practices at work, is likely to misidentify objects, as well as misinterpret their place in the burial context (Heilen, 2012).

Historic cemeteries are also subject to background research unfamiliar to many archaeologists who specialize in older cultures, namely historic records investigation (Herring & Swedlund, 2003). These typically range far beyond the usual land deeds and historic maps that general field archaeologists are accustomed to working with, into the realm of birth, death, christening, marriage, and adoption records; tax documents; wills; newspapers; diaries; church meeting minutes; business ledgers; and many more (ibid). Although such records may provide unique information, their location, transcription, and interpretation is also a discipline which requires experience if not specialized training in order to accomplish successfully and efficiently (Grenham, 2006; Jolly, 2013; Wilkes, 2013). If unused to dealing with historic records, an archaeologist may be unaware of the wealth of information they provide, let alone how to go about finding and interpreting them.

Although historic cemeteries require an unusually high level of recordation, the current state of cemetery reports implies that they are ironically subject to an atypically low level of documentation (Murphy, present volume). Because of the lack of a comprehensive historic cemetery excavation guideline, professional standards do not specifically interdict some of these omissions of data in reporting. Implicitly, however, a low level of recording is discouraged as a basic tenant of archaeological practice (Renfrew & Bahn, 2012; Mays et al., 2015).

On the Books: What are the laws protecting historic cemeteries?

Cemeteries may be unique among historic sites in that they have a substantial subterranean component inherent to their nature (Bell, 1996; Olexa et al., 2006; Batillo, 2012). While many other historic sites consist primarily of structures or surface features, which being visible, must generally be consciously destroyed in order to be overbuilt, cemeteries may have their surface components removed and be reused in a number of ways while a substantial archaeological deposit remains intact. This means that such cemeteries are often “forgotten” and their inadvertent “discovery” during construction projects is therefore frequent (ibid.; Robinson, 1996; Cox (ed.), 1998; Baugher & Veit, 2014). Both these types of sites, and even some cemeteries which are not “forgotten” may be vulnerable under US law. This can
be the result of monetary constraints conflicting with a need to develop, fears about archaeology as a destructive practice versus exhumation, and laws which leave too much leeway when such conflicts arise (Bell, 1996; Robinson, 1996; Bellatoni, 2012).

Under some circumstances, historic cemeteries may be protected from construction. Five main federal laws are relevant to historic preservation, and therefore to some sites (Olexa et al., 2006; King, 2008; Figueroa, 2014). These are:

- **The Antiquities Act of 1906**: Prohibits the unauthorized excavation, removal of defacement of objects of antiquity on public [federally controlled or granted] lands; provides permits for the examination of ruins, excavation of archaeological sites, and gathering of objects of antiquity when undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or education institutions; and authorizes the President to designate historic landmarks situated on lands owned by the US as national monuments.

- **The Historical Sites Act of 1935**: declares that it is a national policy to preserve for public use historical sites, buildings, and objects of national significance, and authorizes the National Park Service (NPS) to identify, acquire, operate, and manage buildings of national significance.

- **The National Preservation Act of 1966**: authorized the NPS to maintain the National Register of Historic Places, a list of districts, sites, buildings, and objects significant to American history, architecture, archaeology, and culture. Federal agencies are required to consider the impact of developing any site listed on the register. Establishes the Advisory Council on Historic Preservation to comment on federal actions that may adversely affect listed sites.

- **The Archaeological Resources Protection Act of 1979**: regulates the excavation and removal of archaeological resources on federal or Indian land and prohibits unauthorized excavation of or damage to such archaeological resources. “Archaeological resource” is defined as “any material remains of past human life or activities which are of archaeological interest” that is at least one hundred years old, including graves and human skeletal remains.

- **The Native American Grave Protection and Repatriation Act of 1990**: protects Native American ancestral remains and cultural items found on federal or Indian lands. It provides a process for remains and cultural items excavated or discovered on federal or Indian lands in the possession of federal agencies or museums to be places under the ownership or control of tribes affiliated with them. In the event of inadvertent discovery of such remains or items during construction, mining, or similar projects on federal or Indian lands, activity in the area must
temporarily cease to allow for protection of the materials. The Act also requires federal agencies and museums to create an inventory of remains and cultural items in their possession. The Act makes it a crime to illegally traffic in covered items.

Most cemeteries that have found protection under these laws are National Register of Historic Places (NRHP) listed sites under the National Historic Preservation Act (NHPA). By perusing the National Register of Historic Places database (National Park Service, 2016), for the keywords “Cemetery”, “Burial”, “Burying”, “Churchyard” and “Grave”, around 1,300 burying grounds, cemeteries, graveyards, tombs, vaults, individual graves, and historic districts which may include cemeteries are listed. This figure includes US territories, and excludes listed non-burial features such as monuments, chapels, and cemetery gates. The true number is likely somewhat lower, as it is not always clear whether certain historic districts include cemeteries or are merely bounded by them. There are also some duplicate listings in the cases of historic districts that include cemeteries which are also separately listed, listed cemeteries with listed cemetery sections, and listed individual graves which may lie within listed cemeteries. Finally, these figures include all burial sites, some of which are older Native burials rather than historic interments. If the estimate that over 300,000 abandoned cemeteries exist in the US is reasonable, this means that only about 0.4% of historic cemeteries in the US are protected from destruction under federal law.

In general, cemeteries and burials are not eligible for recognition under NHPA unless:

- The grave is of a historical figure of outstanding importance and no other appropriate site or building directly associated with the individual’s productive life exists
- It is a cemetery that derives its primary significance from graves of persons of transcendent importance
- The cemetery is distinguished by age, distinctive design feature, or its association with historical events (NHPA, 2014)

In other words, historic cemeteries are not typically considered worthy of preservation for their value to their descendants, their potential archaeological value, or their use as osteological samples. Rather they are “historic” for their antiquity, for their association with specific historic events or individuals, or for their architectural significance (ibid.). As with general state laws preserving cemeteries, NRHP covers states very unevenly: for example, Texas is one of the largest continually occupied states and has only 11 listed burial sites, while New York has 171 (National Park Service,
2016). Table 1 presents an approximate number of NRHP listed burial sites and a summary of the state legislation which could be found governing burials in general and the archaeological treatment of burial places. This excludes applicable laws for general theft, criminal mischief, hate crimes, and other statutes which may apply.
<table>
<thead>
<tr>
<th>State</th>
<th>State Legislation Pertaining to Historic Burials</th>
<th>Approx # NRHP Listed Burial Places</th>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Code of Alabama 1975 § 41-31-1 through 6, § II-47-60 through 74, §35-1-4, §11-17.1 through §11-17-16, § 14-5-33 through 34</td>
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<td>AUWCL, 2016 a; Wofford, 2016</td>
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<tr>
<td>Alaska</td>
<td>§ 41.35.070, 41.35.100, 18.50.250, 11.46.481, 11.61.130, 41.35.200, 34.27.100 through 101, 29.35.030, 41.35.080, 29.55.020</td>
<td>5</td>
<td>AUWCL, 2016 b</td>
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<tr>
<td>Arizona</td>
<td>§ 41-844 Revised, § 41-865</td>
<td>5</td>
<td>Piteitzel, 2016; Arizona State Legislature, 2007</td>
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<td>Colorado</td>
<td>CRS 24-80-401 through 411</td>
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<td>History Colorado, 2005</td>
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<td>DC (Washington)</td>
<td>§ 6-1102, §6-1110; §6-1105, §6-054, §6-1403, 36 CFR §79; §8-109.01, §8-109.03, §8-109.04, §6-1101, 1102, §42-201; §61110.01, §22-3303, §22-3231, §43-123, §22-3314, §22-3312.01, §43-120, §43-126; §42-202; §43-112; §16-1311, §16-1319, §16-1332, §16-334, §1-1315; D.C. Municipal Regulations, Title 10A Historic Preservation §502</td>
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<td>AUWCL, 2016 f; Division of Columbia Historic Preservation Division</td>
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<td>Florida</td>
<td>Florida Statutes 872.02, 872.05; 872.01, 873; 497.384; 497.284; 704.08;</td>
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<td>Florida Division of Historic Resources, 2016</td>
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<td>Georgia</td>
<td>Ga. Code Ann. § 31-21-42; §12-3-10, 1976 &amp; 1981 sections; § 12-3-52; § 12-3-261; §12-3-622 ; §31-21-41; §31-21-43, §31-21-44-44.1; §31-21-44.2; §31-21-45; §31-21-6; §12-3-54, 12-3-621; §12-3-54; §36-72-3; §36-72-4 through 16; §22-1-1 through 14; § 10-14-4, 9, 36-37-6; §44-5-211; § 44-10-27; §32-2-4; § 36-72-14 through 15; § 12-3-50; §36-72-1; § 12-3-52; § 10-14-30; § 12-3-9 through 11, 12-320, 12-3-23; §12-3-50 &amp; 50.1, 50-7-61, 50-7-64; 12-3-55, 44-10-20, 31; § 10-14-31, 10-14-6; § 45-13-40; § 12-3-57 through 58, §§ 28-5120, § 50-7-63; § 12-3-57; § 44-12-280</td>
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<td>AUWCL, 2016 g</td>
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<tr>
<td>State</td>
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<td>Hawai‘i</td>
<td>Title 13 §13.300; §6E-71 and 72; §6E-73 through 75; §6E-12; §711-1107; §711-1108; §6E-11 and 13; §101-2 through 6; § 46-61, §110-4; §6E-8; §6E-43; §6E-10, 42, 6; § 6D-8; §6E-43.6; §6E-41; §6E-43.5; §6E-3; §338-25.5; §6E-6 through 7; §6E-5.5</td>
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<td>AUWCL, 2016 b; Hawaii Historic Preservation Division, 2016</td>
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<td>Idaho</td>
<td>§ 18-7027 and 7028. § 18-5901 and 5903. § 67-4118; §27-502; §67-4120 and 4121; §67-4609; 27-502; § 67-4612, 4120; § 27-502 through 503; § 50-1306A; § 67-4604; §67-4606; § 54-1119; § 67-4121, 4128 through 4129, § 67-4129A &amp; B; §27-407; §67-4126; §65107; §67-4001, 4004</td>
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<td>AUWCL, 2016 i</td>
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<td>Illinois</td>
<td>60 ILCS 1/130-5, 525 ILCS 303/01; 765 ILCS 8359-14; 17 IAC 4170; 760 ILCS 100; 20 ILCS 3440 (1989 Human Skeletal Remains Protection Act); 525 ILCS 30; 760 ILCS 100, 50 ILCS 610; 55ILCS 70, 60 ILCS 1/130-5; 65 ILCS 5/11-49 &amp; /11-50; 65 ILCS 5/11-49 and 5/11-52; 765 ILCS 835; 60 ILCS 1/130; 765 ILCS 835/1-3; 60 ILCS 1/135-60; 330 ILCS 110; 410 ILCS 5; 410 ILCS 18; 765 ILCS 820; 765 ILCS 835; 805 ILCS 320; 55 ILCS 65; 55 ILCS 70; 60 ILCS 1/130-60; 60 ILCS 1/130; 60 ILCS 1/133; 60 ILCS 1/135; 65 ILCS 5/11-49; 65 ILCS 5/11-50</td>
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<td>AUWCL, 2016 j; Illinois Preservation Agency, 2009; Illinois State Legislature, 2016</td>
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<td>Indiana</td>
<td>Title 14-21-1-27 and 28; IC 14-21-1-36; IC 14-21-1-3; IC 23-14-44-1; IC 23-14-72 A and B; IC 23-14-58-1-1 through 5; 14-21-2; IC 1421-1-26.5; 14-21-1; 14-21-1-34; 14-1-1-25.5 (a), IC 4-4-31.4; IC 23-14-54-1; IC 23-14-57-1; IC 23-14-76-2, 23-14-62-2 through 5, 23314-46-1 through 8, IC 14-19-1-2, 36-10-3-10; IC 23-14-67-2 and 4, 23-14-68-1 through 5; IC 14-21-1-13; IC 14-21-1-18; IC 5-15-1-5; 3; IC 14-21-1-13; IC 14-20-1-15</td>
<td>30</td>
<td>AUWCL, 2016 k</td>
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<tr>
<td>Iowa</td>
<td>Iowa Code §1.14; 6A.7; 8.47; 207.8, 21, and 22; 216A.161, 162, 165, and 167; 263B.1, 2, 5, 7, and 8; 303.2 through 4, 7 through 9A, and 16; 305.4, 9; 314.24; 350.4; 404A.1; 457A.1; 465C.8; 481A.38; 523L.202, 203, 205, 304, 305, 309, 311, 314, 316, 401, 402, 505, 604, 805 through 807, 811, 812; 709.18; 714.1 and 2; 716.1 through 7; Iowa Administrative Code- Archaeologist [685]</td>
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<td>Kansas</td>
<td>KSA § 12-1419b and c; 21-3701, 4111; 74-5403, 5408; 75-2748, 5403; 76-2027; Kansas Unmarked Burial Sites Preservation Act KSA § 75-2752</td>
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<td>Kentucky</td>
<td>Kentucky Revised Statutes 61.350; 67.680and 682; 97.540; 307.300; 381.690, 697, 700, 710, 715, 720, 740, 750, 755; 416.210; 525.105, 115, and 120</td>
<td>33</td>
<td>Louisville Department of Anthropology, 2016; Kentucky State Legislature, 2016 a &amp;b</td>
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<td>Louisiana</td>
<td>§ 101, 653, 654, 678, 1605, 1606, 1610, 1614; Cemeteries § 77, 104, 108, 109, 113, 201 through 204, 305, 306, 311, 314 through 316, 659, 660, 680, 802, 803, 903.1, 1605, 1681; Expropriation § 104; Civil code ancillaries §1273; Public Land § 1605, 1606, 1611, 1604, 1607; Public Health § 4; Minerals Oil and Gas § 922; Libraries Museums and Scientific § 127, 521, 522, 502, 912; Wildlife &amp; Fisheries § 1698; Municipalities and Parishes § 2218.2, 2002; State Administration § 158.1</td>
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<td>AUWCL, 2016 n</td>
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<td>Maine</td>
<td>43S10; 8 § 490D; 10§3701; 12§13106A; 13 § 1101 through 1102; 13 § 1031 through 1036, 1071, 1141 through 1143, 1181 through 1184, 1221 through 1224, 1261 through 1267, 1301 through 1306, 1341 through 1349, 1371 through 1373, 1381 through 1386; 13B § 201; 17A§ 402, 507 through 508; 22 § 2708, 2841 through 2844, 3025, 3028A, 3029, 4313; 24A§ 2175 and 2176; 30A § 2901, 3755A, 5723, and 7305; 32 § 1400, 1401, 1403, 1405 through 1406, 3107, 1451; 36§652; 38§490Z; 335A§4710</td>
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<td>Maine State Legislature, 2014</td>
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<td>Maryland</td>
<td>Chapter 719 of 1973; Chapter 348 of 2007; Chapter 212 of 1974; Maryland Cemetery Act 1997</td>
<td>17</td>
<td>Bender &amp; Eastwood, 2011</td>
</tr>
<tr>
<td>State</td>
<td>State Legislation Pertaining to Historic Burials</td>
<td>Approx # NRHP Listed Burial Places</td>
<td>Citation</td>
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<tr>
<td>Massachusetts</td>
<td>MGL c. 114; MGL c 7 s 38A; MGL c 7C s 43; MGL c.9, s.26A; MGL c.9, s.27C; MGL c.38, § 6; MGL c.38, § 6; MGL c.46, § 9; MGL c.114, s.43M; MGL c.190B, s.3701; MGL c. 272 s. 42; MGL c. 272 s.40; 239 CMR; 505 CMR 1; 505 CMR 2; 505 CMR 4; 16 CFR 453; 40 CFR 229.1</td>
<td>125</td>
<td>Massachusetts Court System, 2014; Talmage, 2016</td>
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<td>Michigan</td>
<td>§ 2; 78.10; 95.9; 99.1; 128,12, 31, 34, 41, 44, 52, 71 through 73, and 101; 324.2140 through 2142, 2144, 3121, 63103, 63205, 74302, 73404, 76102, 76103, 76105, 76106, 333.10116 and 2853; 399.2, 4, 111, 113, 155, 201a, 204 through 206, 752; 450.183; 456.100, 101, and 181; 456.2, 11, and 530; 750,160 through 160 d, 167 d, 168, 387, 752, 73; Act 195 of 1972 (16-711 an d715); Act 90 of 1913; Act 215 of 1937</td>
<td>20</td>
<td>AUWCL, 2016 o</td>
</tr>
<tr>
<td>Minnesota</td>
<td>§3.992; 84C.02; 117.012; 138.035, 052, 053, 081, 17, 21, 32, 33, 35 through 38, 40, 41, 51, 57, 161, 226, 581, 585, 586, 661, 662, and 664; 149A.90, 93, and 96; 306.02, 05, 14, 17, 21 through 23, 25, 28, 29, 63, 141, 155; 306.10; 306.42; 307.05, 08, and 082; 333.42; 390.25; 525.14; 609.52, 53, and 502</td>
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<td>AUWCL, 2016 p; Minnesota State Legislature, 2015</td>
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<tr>
<td>Mississippi</td>
<td>House Bill 780; 2013 Mississippi Code Title 41 Chapter 43</td>
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<td>Mississippi State Legislature, 2015; Mississippi Department of Archives, 2015</td>
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<td>Missouri</td>
<td>Mo. Rev. Stat. § 1.200; 183.010; 184.810, 840, and 845; § 194.010, 060, 119, .120, .150, .405 through .408 (2009), and .410; 214.010 (2009), .030, .040, .140, .150, .160, .170, .180, .190, .205, .209, .240, .275, and .455; 253.022, .035, .370, .385, .395, .402, .403, and .408 through .412 (2009); 557,073 (2009) and 557.085</td>
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<td>Montana</td>
<td>1991 Human Skeletal Remains and Burial Site Protection Act</td>
<td>9</td>
<td>McClure, 2000</td>
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<td>Nebraska</td>
<td>Nebraska Revised Statute 28-1301; Nebraska Revises Statute 12-1203</td>
<td>13</td>
<td>Nebraska State Legislature, 2016 a &amp; b</td>
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<td>New Hampshire</td>
<td>Section 635.6 through 8; Section 115-E.2; Chapter 9-13 and Chapter 162-C, section 79-D; Section 227-C.7 through 8g, and 17; Section 289:1, 3, 5 through 7, 9, 10, 15 through 17, 19 through 21; Section 290: 1, 3, 4-a, 5; Chapter 21-M; Section 41.7:1:4; Section 22-A:10e; Chapter 12A:10e; Section 27C:19; Section 27C:29; 28, 30, 42, and 45</td>
<td>9</td>
<td>AUWCL, 2016 r; New Hampshire State Legislature, 2016 a &amp; b</td>
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<td>New Jersey</td>
<td>2 C. 14-1; 17-3 (a) (6); 20-2 (e), 2.3, and 3(a); 22-1 and 1(a)(3) through (3); 43-3 and 6; NJ 2C: 33-9, NJ 18A: 73-22; 13H-10; 23: 7-1.2; Art. 1 § 1; 3B-1-2; 8B-3 and 8C-28; 26-4-2, 5 23 through 26, and 49; 17B-219; 26:13-7; 28-1-5; 13:1B-15.111, 15.112a, 15.114, 15.115, 15.122, 15.130; 40-60-25.40 and 41; 40-10B-2; 40-10D-2, 33B-5, 37-1 et seq., 60-25, 40, 60-1; 61-1 et seq.; 44:4-119; 45:27-7 and 7, 1, 12, 13, 15 through 19, 22 through 24, and 34; 46:2F-9; 58: 4-14, 16A-6, 17B-219; 52:16A-53, 58, and 60</td>
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<td>AUWCL, 2016 s</td>
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<td>State</td>
<td>State Legislation Pertaining to Historic Burials</td>
<td>Approx # NRHP Listed Burial Places</td>
<td>Citation</td>
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<td>New Mexico</td>
<td>NM Stat 40 CFR §§18-6-1 through 18-6-17, as amended through 2005; Title 4 Chapter 10 Part 11</td>
<td>5</td>
<td>New Mexico Historic Preservation Division, 2016 a &amp; b</td>
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<tr>
<td>New York</td>
<td>Not for Profit Corporation Law Article 15 § 1501 through 1517; Other provisions § 202, 404, 603, 605, 725, 726, 1401; Public Health Law § 3441, 4145, 4200, 4202, 4216, 4217, 4218, 4219, 4220; 10 NYCRR Part 13 § 13.3; 10 NYCRR Part 77 § 77.7 (a)(4), 77.7 (a)(5). 77.7 (c), 77.7 (d); Real Property Law § 450, 451; Real Property Tax Law §446; General Business Law Article 28-A §450 through 453; Estates Powers and Trusts Law §11-2.2, §11-2.3; State Finance Law §97-r; General Municipal Law § 164 through 166; County Law §222; Town Law § 291, 292, 292-a, 296; Village Law §15-1500, 1510; Religious Corporations Law § 7 through 9; General Obligations Law § 3112’ Penal Law §145.22, 145.23, 80.00, 60.29, 65.10; 19 NYCRR Part 200 § 200.1 through 201.18, Part 202 § 202.1, Part 203 § 203.1 through 203.12, Part 204 § 204.1 through 204.14</td>
<td>171</td>
<td>New York Department of State, 2016; New York State Cemetery Board, 2016</td>
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<td>North Carolina</td>
<td>Unmarked Human Burial and Human Skeletal Remains Protection Act, Article 3 § 70-26 through 45</td>
<td>77</td>
<td>North Carolina State Legislature, 2016</td>
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<td>North Dakota</td>
<td>North Dakota Century Code, Chapter 23-06</td>
<td>27</td>
<td>North Dakota State Legislature, 2016</td>
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<td>Ohio</td>
<td>Chapter 517</td>
<td>32</td>
<td>Ohio State Legislature, 2016</td>
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<tr>
<td>Oklahoma</td>
<td>Okla. Stat. tit. 8 § 1-3, 8, and 31; 7-185 through 187; 5-132, 133, and 141; Okla. Stat. tit. 21 § 3-82, 84, 86, and 87; 47-1161 through 1163, 1167, 1168, 1168.2 and 1168.4; 69-1789 and 1101.1; Okla. Stat. tit. 27 § 5; Okla. Stat. tit 53 § 1a-1.3, 1.4, and 2.1; 20-355 and 361; Okla. Stat. tit 60 § 2-49-3</td>
<td>25</td>
<td>AUWCL, 2016 t</td>
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<td>Oregon</td>
<td>OAR Chapter 830; ORS Chapter 692; ORS Chapter 97; ORS; Chapter 432; ORS 413</td>
<td>22</td>
<td>Oregon Mortuary and Cemetery Board, 2016</td>
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<td>Rhode Island</td>
<td>Title 23 Chapter 18-11.2 of General Laws, section 42-35-3(c); 23-18-7, 10.1, 11, 11.1, and 11.1; Title 42 Chapter 45, 34-11-1.5; RIGL 45-5-12, 45-3-63, 45-24-1</td>
<td>19</td>
<td>Rhode Island Historic Preservation Commission, 2012</td>
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<td>South Carolina</td>
<td>SC Code Section 27-43-10, 20, 30, 40, and 310; 16-17-600; 49-9-10, 20, 30, 40, 50, 60, and 70; 6-1-35</td>
<td>39</td>
<td>Chicora Foundation, 2016</td>
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</tbody>
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State

South Dakota

State Legislation Pertaining to Historic Burials
§ 1-4-1, 1.1, and 26; 1-18-30.1; 1-18B-4; 1-18C-2 and 4; 1-19A-1, 5 through 9, and 11 through 14; 1-19B-2 through 4, 7, 8, 10 through
19, 53, 54, and 56 through 58; 1-20-26, 21.1, 32 through 35, 37; 1-39-5; 9-32-13, 18, 20, and 20.1; 1-52-12; 2-6-23; 22-30A-2, A-1, A-

Approx #
NRHP Listed
Burial Places

Citation

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AUWCL, 2016

TCA 11-6-1070; 39-17-311 and 312; 46-4-101-104; 46-8-103; 68-3-508 and Rule 1200-7-1-08

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Tennessee State
Historic Preservation
Office, 2016

Texas

Texas Health & Safety Code Title 8, Subtitle C, Chapter 711 Subchapter A

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Texas State
Legislature, 2016

Utah

β 8-505; β 8-2-1 and 2; 8-3-1 through 3; 8-4-2 through 4; 8-5-1 through 8; 9-8-204, 206 through 208, 405, 604, 803, 804, and 806; 99102, 104, 104.5, 104.6; 105, 201, 208, 209, 404, 405, and 704; β 11-104 through 108; 19-3-307; 59-7-609; 59-10-1006; 76-106, 202,
203, 205, 206, 206.1, 301, 302, 404, 404.5, 405, 408, 412, 902, and 903

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AUWCL, 2016 v

Vermont

1VSA § 851, 852, and 853(2010); 3 VSA § 117, 342, 2473; 13 VSA §2023, 3761, 3764, 3766, and 3767; 10 VSA § 422, 2603; 18
VSA §5211, 5212 through 5212 b, 5307, 5318, 5319, 5361, 5362, 5367, 5369, 5373, 5376, 5377, 5379, 5380, 5381 through 5383,
5432 through 5440; 22 VSA § 701, 723 through 725, 741 through 743, 762 through 767, 781, and 791; 27 VSA § 1101,1103, 1105; 24

2

AUWCL, 2016 w

Virginia

β 2.2-2628, and 2629.1 through 2629.2; 8.01-42.1, 8.01-44.6; 10.1-201; 10.1-1003 through 1005; 10.1-1020; 10.1-1237; 10.1-1700,
1701, 1704, and 1705; 10.1-2202, 2204, 2205, and 2214; 10.1-2302, 2305, and 2306; 15.2-2306; 18.2-126 through 127; 25.1-105;
28.1-1204; 32.1-303; 33.1-134, 135, and 136; 45.1-252; 57-27.1, 57-31, and 57-35 through 39.1:1; 62.1-98

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AUWCL, 2016 x

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AUWCL, 2016 y

Tennessee

17, A-17.2, A-17.3; 22-34-1 and 1.1; 34-25-38; 34-27-18 through 20, 22, 24 through 26, 30 through 32; Assessment of damages, SD
State Constitution Art. XVII § 18

Washington

Wash. Rec. Code 9A.20.010, 68.40.090, 27.44.040; Wash. Rev. Code 8.20; 9A.44.10; 27.34.010, 060, 070, 080, 220, 220(5), 240, 250,
250(1)(2), 250(1)(a-d), 270(1-2), 330, 400, and 415; 27.44.020, 030 (1), 040, 040 (1), 055(a), 055(2)(a-b), 055(3)(b) through (d), and
055(4)(a); 27.53.010, 020, 040, 060, 070, 080(1), 095, 100, 110, 140, and 150; 40.14.020(1)-(2), 020(3), and 030(1) through (2);
28B.108.020; 42.56.300 (1-2); 43.17.020; 43.20.025(1) and 050; 43.21C; 25-48-020(4)(a) and (b), 060, and 090; 43.334.020, 030,
075(1-2); 43-60A-70; 68.05.115 and 118; 68.24.070, 080, 090, 100, 180 and 190; 68.50.010, 035, 090, 120, 130, 185, 050, 1010 (3),
and 020; 68.52.040, 050, 045, 190, and 200; 68.56.020; 68.60.010 (4), 040 (1) and (3), 050; 65.04.20; 70.58.230, 260 and 260 1515.SL
Sec. 7; 79.105.600; 84.36.060; Wash Admin. Code 25-12-060; 246-500-020, 030, 040 and 060; 250.76.040; 191-11-069, 484-20-145;
State Constitution Article 1.16 (Amendment 9)

West Virginia

W. Va Code § 29-1-8 and 8A through B Protection of Human Skeletal Remains, Grave Artifacts and Grave Markers, 61-8-14, 37-13-1
through 7; 55-2-1, 55-2-12, 14, and 19; 36-1A-1-4; 51-1-1 and 2 through 2-20; 37-13A-1; 35-5-8; 37-13-1 through 7; 20-7A-5, 16-523; 35-5B-2; 29-1-5, 8, and 13; 35-5-2, 3, 5, 6, 8 and 16; 35-5-7, 29-1-8, 20-5-3, 8-26A-4 and 6; 8-12-5, 14, and 18; 35-5-1, 29-1-1
through 13

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AUWCL, 2016 z; West
Virginia State Historic
Preservation Office,
2016

Wisconsin

§ 69.18.44.47, 440.80; 154.30 (10), 157.04; 157.70 (4) and (5), 157.111, 157.112, 157.70 (2r), 157.70 (3), 157.70 (10), 44.47 (7) (a) 2
and (a) 3, 940.11; 44.47, 44.47 (5); 157.10, 157.65, 32.02 and 03, 32.51, 32.57; 157.60; 157.115; 44.47 s157.70; 157.70 (6), 69.18(4),

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AUWCL, 2016 za

Wyoming

2011 Wyoming Statutes Title 35, Chapter 8

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Justia, 2016


While many cemeteries are protected by their continued use (Olexa et al., 2006; AUWCL, 2016a), and a handful of cemeteries which no longer accept burials are protected under legislation such as the National Historic Preservation Act (NHPA, 2014), most American dead in disused cemeteries are protected only weakly by an uneven patchwork of state laws. In this climate, such cemeteries have sometimes been stripped from distraught descendants by construction interests, or destroyed by negligent landowners who either felt no inherent respect for the remains or erroneously believed that nothing would be harmed by carrying out construction in a cemetery (Bell, 1998; Robinson, 1996; Olexa et al., 2012).

From an archaeological perspective, it has been stated that only 18 US states have strong legislation governing their burials (Ubelaker, 2011). Legal research in the area has concluded that around 35 states have some level of legislation protecting human remains in general (McClure, 2000). Because the strong and weak points of each state’s laws are so variable in analysis of individual laws, it is difficult to arrive at a precise number of states that succeed in protecting historic cemeteries adequately. It is also difficult to discuss them beyond generalities and token examples.

Table 2: States with Non-Native-Specific Unmarked or Historic Burial Protection Acts

<table>
<thead>
<tr>
<th>State</th>
<th>Unmarked Burial Protection Act</th>
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<tbody>
<tr>
<td>Arizona</td>
<td>Arizona Revised Statute 41-844</td>
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<tr>
<td>Arkansas</td>
<td>Act 753</td>
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<tr>
<td>Delaware</td>
<td>Title 7 Chapter 54</td>
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<tr>
<td>Florida</td>
<td>Chapter 872</td>
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<tr>
<td>Georgia</td>
<td>36-71-1 et seq</td>
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<tr>
<td>Hawaii</td>
<td>Hawaii Administrative Rules Title 13 Subtitle 13</td>
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<tr>
<td>Illinois</td>
<td>Title 17: Chapter VI; Part 4170</td>
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<tr>
<td>Iowa</td>
<td>Chapter 523</td>
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<tr>
<td>Kansas</td>
<td>KSA 75-2741 through 75-2754</td>
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<td>Louisiana</td>
<td>Chapter 10-A-Louisiana Unmarked Human Burial Sites Preservation Act</td>
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<td>Missouri</td>
<td>Missouri Revised Statutes, Sections 194.400-401</td>
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<td>Montana</td>
<td>Mont. Code. Ann. § 22-3-902; Montana Code-Section 22-3-902</td>
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<td>Nebraska</td>
<td>Neb. Rev. Stat. § 12-1201 through 12-1212</td>
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<td>New Mexico</td>
<td>Section 18-6-11 NMSA, 1978, as amended</td>
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<tr>
<td>New York</td>
<td>Assembly Bill A5837, Bill A2281</td>
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<td>North Carolina</td>
<td>NC General Statutes Chapter 70, Article 3</td>
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<td>North Dakota</td>
<td>North Dakota Century Code 23-06-07</td>
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<td>Oklahoma</td>
<td>Oklahoma Statute Chapter 47, Section 1168.0-1168.6</td>
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<td>South Carolina</td>
<td>S0765 General Bill to Amend Chapter 13, Title 60, Article 9</td>
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<td>Virginia</td>
<td>§ 10.1-2305</td>
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<td>West Virginia</td>
<td>§ 29-1-8a</td>
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<td>Wisconsin</td>
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</table>
The current research has found that around 22 states (44%) have proposed bills or passed laws constituting generalized Unmarked Burial Sites Preservation Acts, which protect burial regardless of cultural affiliation. These are presented in Table 2. However, these merely prevent the flagrant disturbance of historic burials without following appropriate procedure. Furthermore, most do not universally protect burials on private land, and in unusual, non-burial contexts. Finally, they may have the ironic consequence of assigning rights only to unmarked or abandoned burials, rather than covering all interred human remains equally (Batillo, 2012). Advocates in Ohio and Idaho have encouraged a similar act, while bills are currently under review in the states of New York and South Carolina. Vermont has a special fund for relocating unmarked burials (18 VSA § 5212b) but does not appear to have a general act protecting them. Several other states including Massachusetts and New Jersey have unmarked burial laws which pertain to Native graves, while leaving other ethnicities in limbo. Hawaii skirts this issue by seemingly assuming that all bones are sacred, as they would be to tribes.

In addition to the somewhat uneven provisions of these laws, the current research has found that states may also have either specific laws protecting historic cemeteries, or a network of laws which provide a reasonable level of protection from an archaeological standpoint (AUWCL, 2016 a-za). Georgia, Illinois, Arkansas, and Washington state in particular have very robust laws. South Dakota, Oklahoma, Missouri, Maryland, and California are among the vaguer.

In general, most state have outlined:

- Laws governing cemetery associations, funeral directors, embalmers, crematoria, recent burials, and active cemeteries
- Laws criminalizing the destruction of archaeological resources
- Laws criminalizing trespassing, grave-robbing, desecration of monuments, and often the abuse of human remains
- Law prohibiting the sale of, and more rarely the possession of, human bodies, organs, or funerary objects; however, this may focus only on unlawfully acquired remains or goods
- Laws allowing the state to condemn or seize disused cemeteries via eminent domain for sale or construction, especially in the case of rights-of-way and public works
- Laws governing archaeological practice which may or may not offer special protection to burials or particular buried groups

Such rulings come with many caveats. Many of the general laws center on the destruction or theft of property, which human remains are not under federal law (McClure, 2000; Batillo, 2012). Where the
destruction of historic or archaeological resources is specifically criminalized, the penalties may be insignificant, restrictions may apply only to publicly owned land, and the designation of what constitutes a significant resource may vary (Olexa et al., 2006). For example, state legislation may include wording which protects Native sites as archaeological resources, while leaving historic burials less accounted for (e.g. California, New Hampshire). Alternately the state may have significant public health or criminal laws protecting active burial grounds, but have lax eminent domain laws which allow cemeteries to be condemned with little interference (e.g. Wisconsin). Therefore, in cases where one has legal ownership of the archaeological resource or the land on which human remains lie, they may be at the mercy of the property owner (Bell, 1996).

In general, states protect burials in at least one of three ways. These are 1) strong blanket protections for archaeological resources 2) specific protections for historic burials or burial grounds 3) or a combination of public health and criminal laws which make it more difficult to tamper with cemetery sites (Olexa et al., 2006; Batillo, 2012; AUWCL, 2016a-za). Of these, specific protections for historic burials are the most successful, however blanket protections for archaeological resources can be equally effective if they are not specific to Native sites. A combination of stout laws surrounding archaeological resources with specific provisions for burials appears to be the best of all possible outcomes, however this combination is quite rare. Also relevant is the force that is given to eminent domain laws, and exclusions for resources on private property.

Other aspects of state law vary (AUWCL, 2016a-za). If a state has antiquities law which considers unmarked cemeteries to be historic or archaeological until shown otherwise (e.g. Texas), they may receive sufficient initial protection under antiquities law alone. Other states have legislation in addition to NAGPRA which is fairly considerate of Native burial places, but does not seem to consider other types of burials (e.g. California, Idaho, New Hampshire, Hawaii). The language of these implies that “excavation” is something related to the recovery of Native burials, while leaving the possibility open that avenues other than excavation should typically be expected in the case of historic burials. Others have little focus on historic cemeteries, but have a robust interpretation of laws protecting archaeological resources (e.g. Indiana, Washington D. C., Wisconsin). This is not always assurance that historic burials will not be disturbed however. New Jersey, New Hampshire, Minnesota, and California stand out as states which rely on historic preservation laws which may inadvertently exclude historic cemeteries. Kansas has historic protection laws which, while fairly specific, carry low penalties and sometimes focus more heavily on fossils than archaeology (KSA § 21-379). Finally, some states have
laws protecting burials places specifically. The state of Washington has robust laws across the board (Battillo, 2012). West Virginia has a permitting process for the excavation of burials, even on private land (W. Va. Code § 29-1-8A, 37-13-2), as does Virginia (§ 10.1-2305). Wisconsin has stiff fines for disturbing burials and considers the right to a lot in which a person is buried inalienable (157.70(3); 157.10). However, their laws on eminent domain make many allowances for the condemnation and disposal of properties, seemingly including cemeteries (32.02 to 32.03).

Even where laws protecting cemeteries or graves exist, the penalties vary wildly (AUWCL, 2016 a-za). New Hampshire carries a fine of $1000 or six months in prison for the destruction of a historic resource (Section 227-C:17). Georgia’s fine may be $5000 per grave and imprisonment (Penalties. Ga. Code Ann. § 36-72-16). Hawaii carries a fine not to exceed $25,000 (§6E-71 and 72). In Washington, multiple acts surrounding various disturbances to graveyards are felonies, resulting in a fine of $5000 for each occurrence (Wash. Rev. Code 27.53.095). The disturbance of a body in Michigan may result in ten years’ imprisonment (750-160), and fifteen years in Vermont (13 VSA § 3761). Other states have miscellaneous legislation which may inadvertently prevent the relocation of historic cemeteries. Washington D.C. for example, has a public health law which prevents the exhumation of the graves of those dying from diseases such as smallpox and cholera (§ 43-123). Presumably, many of the dead in historic cemeteries died of such diseases, yet the identity of those graves may not be clear enough to excavate cemeteries in general while complying with the law. The actual health risk posed is relatively unstudied (Borstel & Niquette, 2000), however, if such a law was followed strictly, it would prevent the disturbance of cemeteries in many cases.

Eminent domain, perpetuities laws, and classification of a cemetery as “abandoned” are relevant to how the resource may be treated. Before a cemetery may be considered abandoned in Georgia and Arkansas, for example, burials must have ceased for 75 years, making all burials historic by definition of federal law (Ga. Code Ann. § 44-5-211). In California by contrast, this limit is only 2-5 years (Health & Safety § 7600, 7701). The process of abandonment may begin after just one year of disuse in Missouri (Mo. Rev. Stat § 194.407 (2009)). In some states, the abandonment of cemeteries is followed by a period of municipal upkeep (e.g. Wisconsin, Missouri), while in others, they may be more easily condemned and relocated instead (e.g. California, Kentucky). Additionally, in many states, the keepers of a burial ground may willing sell the property, provided the remains are relocated (e.g. Pennsylvania P.L. 310 No. 238). Almost no states have procedure for submerged burials (Batillo, 2006; AUWCL, 2016 a-za), a fact that is relevant as the creation of reservoirs over unmarked burial places has resulted in many sites of this
type (King, 2005). Finally, older cemeteries may be considered “non-sites”, with lawmakers assuming arbitrarily that nothing remains of burials after a set period of time, or giving less consideration to skeletal remains than those which still maintain flesh (Battillo, 2012; Tonetti & Burks, 2014). Therefore, such sites may quite wrongly fall outside of legislation in place to protect “burials”.

In most states, loop-holes also exist in eminent domain and historic disturbance laws for state Departments of Transportation, economic interests, municipalities, or certain public works (Olexa et al., 2006; Batillo, 2012). These gaps in the law may be minimal or vast (AUWCL, 2016 a-za). In Georgia, the DoT and local governments are exempt from the laws preventing the alteration of historically designated properties (§ 44-10-27). Wisconsin extends these powers to municipalities, the governor, most public works, oil and gas interests, and transportation unless the property is owned by the state, if its purchase would violate monopoly interests, or if it is not “blighted” (§ 32.02, 32.02, 32.51). Washington is one of the few states that considers cemeteries to be permanent, “out of respect for the dead and because it benefits the general public” (68.24.070 and 080). Typically, even where burials are protected, they may be moved subject to appropriate permissions and permitting (Bell, 1996; Robinson, 1996; AUWCL, 2016 a-za).

When it comes to the archaeological treatment of sites, the law also may differ (AUWCL, 2016 a-za). The State Historic Preservation Office (SHPO) for each state is responsible for developing archaeological management plans, inventorying known archaeological sites, coordinating with projects which may endanger archaeological resources, and creating a repository for what information the organization and state law dictates that the SHPO preserve (Olexa et al., 2006; Green, 2009). The SHPOs were created federally under section 101 of NHPA (King, 2008). They have eight specific duties:

- Direct and conduct a comprehensive state-wide survey of historic properties and maintain inventories of such properties in cooperation with Federal and State agencies, local governments, and private organizations
- Identify and nominate eligible properties to the National Register and administer applications for such
- Prepare and implement a state-wide historic preservation plan
- Administer the State program of Federal assistance for historic preservation within the State
- Advise and assist Federal and State agencies and local governments in carrying out their historic preservation responsibilities, as appropriate
• Cooperate with the Secretary, the Advisory Council on Historic Preservation, and other Federal and State agencies, local governments, organizations, and individuals to ensure historic properties are considered at all levels of planning and development
• Provide public information, education and training, and technical assistance relevant to Federal and State Historic Preservation Programs
• Cooperate with local governments in the development of the local historic preservation programs and assist them in becoming certified pursuant to subsection (C)

However, the precise roles of such organizations in carrying out these duties may be further clarified in state law, or left up to the organization. For example, the majority of states do not have specific regulations mandating the creation and maintenance of a historic archive, and many lack specific funding for museum and educational resources (Olexa et al., 2006; AUWCL, 2016, a-za). The state may not enumerate instances where archaeological intervention is required and therefore create a situation in which the SHPO is less empowered in the administration of total archaeological resources in the state (e.g. Iowa). Even those states with strong public archaeology laws may merely discourage archaeological activities surrounding burials on private land (e.g. Washington D.C., Georgia).

In addition to the SHPO, states may also have a State Archaeological or Historical Preservation Commission (Olexa et al., 2006; AUWCL 2016, a-za). Other states have delegated the bulk of these responsibilities to a University or an archaeological organization which subsumes some of the functions as the SHPO for all intents and purposes (e.g. Arkansas Archaeological Survey; Thomas Edison State College archive in New Jersey). Some states, such as Missouri, have no discernible law dictating who is responsible for conducting archaeological inquiry and in which contexts in the state (AUWCL, 2016 p). Alternately, as many cemeteries fall outside of the criteria for being listed as NRHP sites, some states may delegate the bulk of the responsibility of caring for cemeteries to religious organizations, cemetery boards, or to municipalities (e.g. Illinois). Unstandardized as such organizations are, they are variable in their quality. On the positive side, however, they have utilized existing archaeological bodies to mitigate some of the cost and difficulty of establishing new organizations for the purpose of monitoring historic resources.

Stipulations surrounding archaeological fieldwork are likewise irregular. Georgia requires the hiring of an archaeologists to supervise or conduct work where cemeteries must be relocated (§ 36-7214 through 15). Illinois also makes this specification and adds that degree-holding osteological specialists must be involved in Illinois Historic Preservation Agency excavations. New Hampshire is one of the few
other states stipulating that an osteological specialist be employed, however this appears to be specific to the treatment of Native burials (Chapter 21-M). Idaho also requires archaeological involvement at the expense of the archaeologist, but this also appears to be in reference to Native burials on public lands (§ 67-4120). New Jersey is one of the few to require that archaeological investigations must be conducted in the least destructive manner possible (13:IL-1). Iowa makes this requirement explicit only for the Department of Transportation (Iowa Code § 263B.5). Washington D.C. states less forcefully that a good faith effort should be made to minimize destruction to cemeteries during construction (D.C. Municipal Regulations, Title 10A Historic Preservation, §502 Historic Properties with Potential Archaeological Significance). West Virginia stipulates that where cemeteries are unlawfully disturbed the penalty should include the cost of data recovery among other consequences (29-1-8A). Washington is apparently the only state which specifically prohibits the collection of archaeological data from any burial unless it will be reburied or preserved in an archaeological repository and the SHPO has granted permission for research and removal (Wash. Rev. Code 27.44.020). This is likely a result of the high-profile case of Kennewick Man, which resulted in national contemplation of the laws surrounding inadvertent discoveries and remains of uncertain origin (Battillo, 2012).

Under most state legislation, burials on private land may be relocated by an exhumation contractor or other non-archaeological professionals (Bell, 1996; Robinson, 1996; AUWCL, 2016 aza). This is often subject to permitting, but in some instances, may be done at the whim of the land owner (Battillo, 2012). In the most egregious cases, archaeological responsibilities are barely defined under state law (e.g. Missouri). More conscientious states include kin more explicitly and may have public hearings as a component in the disposition of remains (e.g. West Virginia, Wisconsin, Washington). However, in other states, the duty of informing descendants may be completely ambiguous or extend only to printing a notice of intent to disinter in the local newspaper. In effect, this may mean that burial relocation goes unnoticed by descendants who no longer live locally or are not aware of ancestors in a forgotten cemetery. The resulting feeling of secretive or exclusionary behavior has often created tension both between contractors and the public, and between the public and archaeologists (Bell, 1996; Robinson, 1996). It has been estimated that the number of archaeological sites destroyed yearly because they do not trigger federal, state, or local preservation laws must number in the thousands (Green, 2009).
In the Field: What are the realities?

Where burials are unexpectedly encountered, the procedure in most states involves the notification of law enforcement or the coroner (AUWCL, 2016 a-za). Several other states, including Pennsylvania do not have a notification procedure (Battillo, 2012). Occasionally, particularly if found on public land, the state archaeologist must be contacted where historic burials are suspected. If continued disturbance is planned, relocation must typically take place in order to avoid various statutes which may apply to the disturbance of burials, grave robbing, or the possession of remains or grave goods (ibid. AUWCL, 2016 a-za). However, even where archaeological intervention takes place, it is largely unstandardized in its practice (Bell, 1996; Robinson, 1996).

All states appear to adhere to the secretary of the interior’s qualifications for archaeological investigators in projects involving the SHPO (National Park Service, 2014; 36 CFR Part 61: Appendix A). These are essentially identical to those promulgated by the Register of Professional Archaeologists, a qualifying body which certifies the competence of its members (RPA, 2016). The minimum requirements for archaeologists as stated by the Register of Professional Archaeologists are generally the possession of a Master’s Degree, one year of full time professional field experience, four months of supervised field experience (field school), and demonstrated ability to bring projects to completion (ibid.). These standards are generally adhered to in archaeological excavations sanctioned by all states, however several factors mean that even these criteria are not a guarantee of the highest standard of archaeological work.

In many cases, even where archaeology takes place on public land, the work may be subcontracted to a Cultural Resource Management (CRM) firm. By some estimates, 80-90% of archaeology in the United States is conducted by CRM firms (King, 2005). Numerous criticisms have been leveled against the practice of Cultural Resource Management. These include simplistic research designs, mindless compliance with regulation, lack of publication, unreasonable deadlines, small projects producing meaningless results, and inadequate methodology (ibid., Green, 2009). Many of these criticisms have not changed in the forty-five years since CRM has become a profession. Although Green optimistically states that funding for analysis is available during CRM projects as opposed to university projects, and that reports are written and retained by SHPOs (2009), this is not necessarily so. Often, especially in the case of historic cemeteries, full osteological analysis is not undertaken, to say nothing of artifact analysis and other standard feature measurements (Murphy, present volume).
Other typical areas of inquiry such as research designs are commonly neglected (King, 2005; Green, 2009). It is a well-known peculiarity of historic cemetery excavation that bulldozers are often used to strip the surface (King, 2005), as though it did not have potential to be a rich archaeological context (Mytum, 2000). Depending on the state and the land status, the cost of removal and reburial of remains may fall on the land owner, the archaeologists, the party which initially disturbed the remains, the entity necessitating the excavation, or it may be unspecified (AUWCL, 2016 a-za). In some states, some financial assistance may available through archaeological trusts raised through specific types of taxes, however this is not necessarily the norm (ibid.; Olexa et al., 2006).

Furthermore, as most states have no specific requirement about the dissemination of reports resulting from archaeological fieldwork, the results of excavation on private land may not exist in any repository (e.g. District of Columbia, Missouri, Pennsylvania, Utah). Such reports may be submitted to the land owner, such as a church or corporation (Bell, 1996). However, this is no guarantee of their long-term retention or quality. Rather, they may be written to highlight the fact that the land is now “cleared” or the discuss a part of a church history, while neglecting other areas of archaeological reporting (ibid.; Murphy, present volume).

Even where reports for projects on public land are concerned, they are not necessarily subjected to intensive peer-review by individuals outside of the organization that produced them because they are unpublished. The State Historic Preservation Office will typically comment on whether the report meets state guidelines and the secretary of the interior’s standards (Green, 2009). However, they may be reluctant to slow projects with more critical review that necessitates further research (ibid.). Physical Anthropology or Human Osteology remains a relatively rare specialty within the discipline of archaeology (Buikstra & Ubelaker, 1994), and because of the relative rarity of academic excavations of historic burials, many specialize in a different area of the world where access to archaeological remains may be less taboo. Most states do not specifically require the participation of an osteologist in the excavation of historic cemeteries: Illinois is one exception (Illinois State Preservation Agency, 2009; Illinois State Legislature, 2016). Although some states require that archaeologists have experience with urban archaeology (e.g. District of Columbia), no state to the author’s knowledge requires that a historic archaeologist participate in the excavation of historic sites.

It has been suggested that environmental laws, city and county zoning powers, easements, and purchase by land trusts are one way around the exclusion of archaeological sites on private land from many of the regulations that protect archaeological resources on state land (Green, 2009). However, it is
not clear how often these methods are exercised, particularly in reference to historic cemeteries. In general, while professional archaeological intervention may be required in some cases for sites on public land, no archaeological intervention whatsoever is usually necessary on private property, no matter the significance of the site (Bell, 1996; Olexa et al., 2006; AUWCL, 2016 a-za). In some states, permission to disturb archaeological sites on private land is not even required (ibid.). This may be mitigated by states which have strong laws dictating the involvement of kin and interested parties prior to the disturbance of burials, however such states are the exception rather than the rule (e.g. West Virginia, Wisconsin, Washington).

CONCLUSIONS:

State regulations governing archaeology in historic cemeteries are highly uneven (Battillo, 2012; AUWCL, a-za). Although many state laws have some successful components, most leave out important areas that could contribute to the protection of archaeological resources and respect for human remains. As a result, archaeological practice in regard to these sacred and data rich has often fallen below typical professional standards (Murphy, present volume). Several recommendations could help to unify the current legislation. These are 1) Protection of burials regardless of ethnic origins 2) Protection of burials regardless of land status and marking 3) Unified process including early archaeological involvement and improved inventory of sites 4) Archaeological standards dictated by archaeological best practice rather than economic expediency or arbitrary law 5) Creation of unified reporting standards and 6) Creation of funding and mandatory repositories for archaeological information.

First, all burials should be protected under the law, regardless of ethnic origin. Second, all burials should be subject to some level of archaeological assessment and legal oversight, regardless of whether they are on public or private land, marked or unmarked; submerged or unsubmerged. In addition to initial coroner and/or law enforcement involvement, the state archaeologist should be contacted in the case of inadvertent discoveries of human remains. This is the only way to ensure that the historicity of burials is appropriately considered and assessed before any further action is taken (Bell, 1996). By Federal standards, objects older than 50 years are “archaeological” if on public lands (NHPA, 2014; National Park Service, 2016a). However, the age at which objects become “historic” may vary by state (Batillo, 2012; AUWCL, 2016 a-za). Health and safety regulations may mean that traditional archaeological excavation is not possible for fifty-year-old remains requiring relocation (Borstel & Niquette, 2000), however, at minimum archaeological research, testing, or monitoring should be a
component of all such projects. This is especially true as a cemetery which is initially thought to contain recent remains may also turn out to have contained much older remains as a project progresses (King, 2005). Arbitrary standards which assume that burials no longer exist after a certain period of time should be done away with (Tonetti & Burks, 2014). From archaeological contexts, it is known that human remains in burial contexts may survive for many thousands of years. As such, it is both detrimental to archaeological sites and counterproductive to developers to pretend that nothing will be found or destroyed after even a few hundred years.

While the rights of private land owners, the need for construction projects to go forward, and the ubiquity of eminent domain is an inevitability (King, 2005; Battilo, 2012; Boyle, 2015), creating a standardized process that involves archaeological evaluation would prevent the loss of unknown resources, backlash from descendant groups, and the desecration of burials (Bell, 1996). Processes for notification of kin and due diligence efforts to identify the cemetery should be standardized so that a cemetery can no longer be moved without first ensuring the awareness of interested parties. Merely alerting the local community that a cemetery is to be moved is insufficient if no one remembers the cemetery, or the descendants have since moved away. If historians and archaeologists are not required to be involved in this step, it seems likely that the results will likewise be unprofessional.

If removal is being considered, cemetery delineation is a necessity in order to adequately assess the scope of the project (Bell, 1996; Davenport, 2001; Atz & Weaver, 2006; Doolittle & Bellantoni, 2010; Heilen & Grey, 2010a; Matternes et al., 2012 a). Where archaeological excavation is deemed to be the appropriate course of action, the involvement of specialists should be dictated rather than implied. This is because a fully accredited professional archaeologist may nevertheless lack the skills and experience to deal with these highly specialized sites (Buikstra and Ubelaker, 1994; Mays et al., 2015).

To aid with these efforts, funding should be set aside for the assessment of historic cemeteries. This could be derived from taxes to existing burial grounds, taxes to funerary professions, federal funding for historic resources, trusts, or other sources (Smith, 1997; Olexa et al., 2006; Olexa et al., 2012; Green, 2009). Guidelines should be established for historic cemetery reporting, and such reports should be subject to peer review. While this is already a function of the SHPO, it has been observed that such peer review may be less critical than professional practice would typically dictate (Green, 2009). Indeed, recent research has shown that it is often not adequately carried out (Murphy, present volume).

Each state should establish a single repository for archaeological reports, and make the results of those reports available online. Not only would this ensure that the results of such projects were available
to future researchers, it would enable affiliated communities and interests to benefit from such projects, which is a central goal of Federal historical protection laws. Maintenance of archives is also often a function of the SHPO, but is not universally enumerated in state law, and it does not specify the inclusion of all archaeological reporting per se (AUWCL, 2016 a-za). Such an online database, the Archaeology Data Service, has been established in the UK (ADS, 2016; Green; 2009). Although a National Archaeological Database exists for the gray literature reports of the National Park Service, as of 2016, the site had been archived and was unusable (NPS, 2016b). Archaeological projects should undergo peer review by external sources as well as the SHPOs in order to ensure objectivity. It has been suggested that reviews of final reports and the publication of the comments alongside the final product would not slow projects, but would subject any inadequate organizations to scrutiny (Green, 2009).

Taken together, these regulations would alleviate some of the current failings of the CRM practice both by dictating better technique, and by giving clout to CRM practitioners who may presently be constrained by the greater legal and economic pull of developers (King, 2005; Green, 2009). Although not always considered so, archaeology is a much more delicate means of relocating the historic dead than exhumation (Robinson, 1996; Murphy, present volume). It is more ethical both for the care that it shows to fragile remains, and for the nation’s veneration for its collective history. The law should give archaeology a more central role in cemetery relocation, even if only to argue for more strongly for archaeological treatment among the options. In order to foster the social change that makes such ideas feasible, positions devoted to public education in archaeology are necessary, especially for CRM firms who constantly must educate contractors about the costs of archaeological projects (Green, 2009). Although NAGPRA has come with challenges, the implementation of a HGPA (Human Graves Protection Act) is long overdue. Such a law would be beneficial to the practice of archaeology in America as a whole, to the balance of rights of different interest groups, and to the treatment of our ancestors.

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Chapter 13: Conclusions & Future Research.

INTRODUCTION:

This project has been an attempt to understand the appearance of infant mortality and taphonomy in American and British archaeological populations from the recent past, with the ultimate goal of being able to apply these findings to a wide range of archaeological populations. These aims have been met in two ways. First, infant mortality from an unprecedented number of historical excavated cemetery populations was studied and compared with burial records in a small number of cases. Secondly, this mortality and the experimentally derived taphonomic loss between burial and retrieval was used to inform the understanding of early life mortality in more ancient cemeteries. While this does not necessarily answer questions about the behaviours of the study populations in depth, and the specific analysis of the social conditions of those few hundred populations would have occupied a larger volume than this, this knowledge of infant mortality and preservation may be applied to literally every archaeological excavation studying mortality or preservation. The knowledge that infant mortality is highly variable, even in older populations, and that infant remains do not necessarily inherently preserve poorly in archaeological contexts allows researchers to better determine whether what is observed in their sample is true to the profile of the initial burial population. It is only with this knowledge that they can make informed statements about population behaviours which lead to observed patterns of mortality and preservation.

In the course of the work, additional questions were raised. These included why comparatively few excavation reports include specific age at death data, when such information ought to be standard (Buikstra & Ubelaker, 1994). This further called into question why the quality of US cemetery excavation reports appeared to be so variable in general. Data recordation, the fundamental tenant of archaeological practice (Renfrew & Bahn, 2012), appeared to be lacking in many reports. While sampling prioritization and the data which it is possible to collect is necessarily based on what exists at a given site, the basic documentation of archaeological data is quite uniform. Where historic cemeteries are concerned, data included as a basic part of the archaeological process should comprise surface recordation (Mytum, 2000); burial furniture analysis (Springate, 2014; Pye 2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013); historic artefact analysis (Heilen, 2012); osteological analysis (Ubelaker, 1978; Buikstra and Ubelaker, 1994; Brothwell, 1981); and application of general field methodology (Renfrew & Bahn, 2012). Though somewhat subjective in nature, the relative success of reports in collecting and
including these categories of data was addressed through an extensive survey of the content of historic cemetery excavation reports. The questions of why inclusion varied was assessed via a study of legal standards, the historic precedent of NAGPRA, and public reactions to burial archaeology in the media. This aspect of the research showed that the best excavation records typically come from those locales with strong state law protecting historic burials and encouraging archaeological practice.

**INFANT MORTALITY & TAPHONOMIC SURVIVABILITY:**

The comparison of mortality derived from burial records to that derived from excavation reports in the course of this research has shown a 10-15% loss between true infant mortality and infant mortality secondary to taphonomic loss. Crucially, the loss to infants is not substantially greater than the loss to adults, and may be less in some cases than the loss to children. The long-repeated statement that infant remains inherently survive poorly (Buckberry, 2000; Baker et al., 2005; Djuric et al., 2011), is thus refuted. This implies that infant mortality may be studied with some reliability via osteological data derived from historic cemetery excavation reports; i.e. if the mortality profile of an archaeological cemetery appears to be “normal”, it is highly likely that it actually resembles the initial composition of the buried population more closely than previously believed, if the original burial practices and level of taphonomic disturbance can be postulated to some extent. The greatest distortion in burial populations is in fact among the older adults, among whom osteological aging techniques produce less precise results (Buikstra & Ubelaker, 1994).

When compared with what is known about the post-deposition history of the site, model life tables, and understood in terms of common ages at death owing to several known hazard stages throughout early life, the mortality data derived from cemetery excavations may be determined to be either plausible or implausible, with an assumed minor and predictable loss owing to taphonomic factors. Such mortality risk-periods appear to take place within a month of birth owing to congenital defect, within three months of birth owing to unsanitary birthing practices, and between 6 months to two years corresponding to the age of weaning (Newman, 1906; Ruttiman and Loesch, 2012). Deaths in early childhood may correspond with accident or epidemic (Chamberlain, 2006). Environmental factors should be taken into account, with population growth, crowding, and active urbanization or frontier living considered as factors likely to produce heightened mortality profiles in the early juvenile years.

In the seventy-three British and American cemetery excavation reports with osteological mortality data, infant mortality was found to range from ~15-35% in the majority of cases. These figures
represent an accurate reflection of infant mortality from the time period, correlating with some historical observations of infant mortality (Fogel, 1986, 2004; McKeown, 1976; Newman, 1906; Ruttiman and Loesch, 2012; Wrigley and Schofield, 1989), as well as modern observations of infant mortality in societies in different stages of industrialisation and medical and public health development (Barbieri, 2001; Matthews & MacDorman, 2007; Kuehn, 2008; DOI, 2012). This further corroborates the finding that archaeological observations of mortality, where they appear to be normative, may be relied upon as relatively truthful representations of the mortality of the population from whence they came. The erroneous belief that historical infant mortality was “high” is thus refuted. While typically higher than modern western societies, this historic infant mortality exhibits a wide range dependent on the health and behaviours of the societies from which it was derived. Although caution should still be exercised, and observed mortality from excavated cemeteries may not be an exact correlate of actual mortality, as a proportion of the population’s mortality, it may be relied upon to a greater extent.

In general, British infant and child mortality was lower than American and in each society, two to three distinct mortality clusters could be seen. These do not appear to correspond with heightened mortality or retrieval in any climatic region. Instead, increased early life mortality formed patterns which may coincide slightly with societies undergoing developing urbanization. Even when accounting for minor taphonomic loss, in many cases, this range is often lower than the “high” infant mortality of around 30-50% that has been postulated by earlier researchers. In some cases, it may even have been on par with moderately developed countries of the present day. This knowledge is interesting for those researching older populations, as it illustrates how quickly mortality may stabilize following upheavals such as industrialization. It also demonstrates how similar populations (e.g. genetically homogenous with similar traditions and economic structures) may exhibit variable mortality.

These historical mortality trends were compared successfully to more ancient populations, to inform current views of whether or not infant mortality from much older excavated populations may retain a plausible distribution. In the case of the British Neolithic, different types of burials resulted in different mortality patterns. Patterns and levels of infant mortality similar to historic cemeteries could sometimes be observed even in these very ancient groups. This suggests that where infants are missing, differential burial and secondary burial rather than natural taphonomic loss (for example, from soil acidity) may be more strongly implicated, as large percentages of infant remains appear to be present in some burial types (e.g. caves and causewayed enclosures) but not others (e.g. large mounds). The observation of normative infant mortality profiles in such ancient populations further corroborates the
finding that infant remains survive in archaeological contexts, and that infant mortality does not become exponentially higher the farther back in time one looks. Therefore, in the study of even very ancient burials, the appearance of “normal” and “abnormal” mortality profiles may be trusted to a greater extent: if normal, the mortality observed may be cautiously relied upon even if fairly low, while if abnormal, “poor innate survivorship” among infants should no longer be blamed.

The research was thus successful in demonstrating three innovative and important facts regarding infant mortality in archaeological populations. First, infant mortality is not universally “high”. Although it is generally greater than that in modern developed countries, researchers should no longer resort to vague statements about its extent, as though it were unqualifiable or unpredictable. Rather, they should look to factors inherent to the population of study in order to account for the mortality profiles that are witnessed. Second, preservation of infants in taphonomic contexts does not appear to be poorer on average than other age groups based upon intrinsic factors. Infant mortality may be trusted to the same extent as older age groups, unless factors like physical manipulation of remains in the burial context can be postulated. Finally, osteological datasets from historic cemeteries have great potential to answer broader questions about older archaeological populations, from extrapolating what is known into incompletely understood time periods. Historic archaeology is a developing field of archaeological inquiry, that sometimes finds itself isolated from the study of older cultures. Often its study has been minimized in favour of “more important” time periods of greater antiquity. However, this is a mistake. Bioarchaeology, likewise, may be insulated from other branches of archaeology, when its researchers should strive for a more integrative approach (Ubelaker, 2011). Together historic archaeology and bioarchaeology have great potential to break new ground across the profession, if they begin to be studied with full cognizance of the questions they have the potential to answer.

**HISTORIC CEMETERY EXCAVATIONS:**

One of the greatest detriments to studying historical mortality is the uneven collection standards of osteological data and the quality of historic cemetery publications. Little work on the subject has existed until the current study, when it was found that the original work could not easily be accomplished because of the lack of publication of excavation reports, and the failure of existing reports to include mortality data. While several well-publicized and high quality publications in the form of excavation reports and guidelines specific to historic cemeteries exist for the United Kingdom (Mays et al., 2015), fewer such projects exist in the United States. To a physical anthropologist, the lack of
mortality data in reporting surrounding any osteological population is a clear and obvious indicator of a fundamental professional lapse (Buikstra & Ubelaker, 1994). Yet to express the sense that the majority of cemetery excavation reports are somehow “deficient” or “unprofessional” is only fustigating without first quantifying and describing the extent of the damage.

To this end, cemetery reports were surveyed for their inclusion of standard categories of data based on the types of features, artifacts, and ecofacts frequently encountered in historic cemeteries (Ubelaker, 1978; Buikstra & Ubelaker, 1994; Brothwell, 1981; Reeve, 1998; Mytum, 2000; Duday, 2006, 2009; Springate, 2014; Pye 2010 a, b, c; 2011 a, b, c, d; 2012 a, b, c; 2013; Heilen, 2012). Although far from comprehensive, a survey of one-hundred-and-nine excavation reports indicated that recording criteria were lacking particularly in the areas of archaeological methodology and osteological data collection. Historical and artefact data collection fared slightly better, though were still underrepresented. Less than 10% of projects reported on the full suite of data that might be expected. These findings reveal that greater adherence to traditional archaeological methodology is necessary in the publication of historical cemetery excavations in the United States. With the exception of updating preservation metrics (Brickley & McKinley, 2004), discovering reliable technology for subterranean surveys of cemeteries (Robinson, 1996; Davenport, 2001; Atz & Weaver, 2006; Doolittle & Bellatoni, 2010; Heilen & Grey, 2010a; Matternes et al., 2012 a), and the creation of digitized recording apps which would speed the collection of spatial data from cemetery excavations, such methods need not be revolutionary. The methods which ought to be used in historic cemeteries have long been part of the common archaeological toolset: they are simply not being put into practice. The use of appropriate specialists is lacking, as is the devotion of sufficient time and funds to adequately address historic cemeteries in a professional, archaeological manner.

The question of why such discrepancies exist between the results of archaeological publication in the US and the UK is an important one. On paper, the requirements for archaeological practice are very similar whenever archaeological projects are undertaken (Mays et al., 2015; RPA, 2016). The legal necessity for engaging in archaeology in the US may be considerably less homogenous however. Although little formal data exists on cemetery exhumation versus archaeological excavation of historic cemeteries (King, 2005), an exploration of legal standards and media portrayals provides insights into why more uniform standards appear to have developed in the United Kingdom while practice in the US is variable. Owing to the colonial history of the United States and increasingly ambivalent secular attitudes to death, the public may be mistrustful of archaeology when it comes to burial. This is
exacerbated by uneven legal standards which have resulted in an adversarial relationship between corporations and the public. Under such circumstances archaeologists may frequently be pressured to conduct research under temporal and monetary constraints, in areas outside of their expertise. This is particularly true for cultural resource management in the private sector.

These issues must be resolved if infant mortality, and indeed many aspects of historic cemetery archaeology in the US are to be studied in greater depth in the future. Because historic cemeteries are large osteological datasets which may have specific associated records giving information like sex and age at death, they provide a unique opportunity to refine osteological methodology. However, this is only the case if such data recorded is meaningfully linked in reporting. For example, if grave depth, sex, and age are reported but not linked together, it is impossible to later use such data to inform the study of preservation by depth and age. General aging, sexing, and preservation methods can be improved, but again only if the burials are carefully recorded and presented in such a way that later researchers can critique previous studies and expand on them. Other population-specific historical questions like the study of osteological hallmarks of occupation or diseases that specific individuals were known from record to have suffered, can be considered with careful osteological recording. The seasonality of death by age can be studied if age and palynology are correlated. This in turn can be used to hypothesize causes of death, such as seasonal epidemic or likely vitamin deficiency. Expressions of status and treatment via burial goods can be correlated with biological factors. Yet again, to be most meaningful, specific provenience data (i.e., which individual was actually buried with the ornate brooch and the silk coffin lining? What did the study of stress indicators on the bones of Tom the tubercular brickmason actually show?) is needed in conjunction with meaningful osteological analysis to answer these questions.

**RECOMMENDATIONS & CHALLENGES:**

Specifically, to expand the study of infant mortality, it would be worthwhile to incorporate more populations into research of this type. This is especially true of a broader range of ethnic groups who exercised different burial practices, for example Jews, Muslims, Mormons, and more specific distinctions between Catholic and Protestant practices. The inclusion of such populations would shed more light on how mortality varies between region and group, as well as how taphonomic processes may be altered by differential burial method. Additional studies comparing infant mortality from burial records with that from historical cemetery excavation would further hone the data on taphonomic loss
between burial and retrieval. It would also be beneficial to compare other record sources such as death certificates to burial records to further assess the reliability of the mortality data present in specific burial records. Records of this type were standardized across Australia and Europe, particularly in Ireland and Scandinavia, so many untapped resources currently exist. Such records can shed light, not only on these questions, but on numerous aspects of mortality and burial. These range from the seasonality of epidemic deaths to the arrangement of cemeteries based on family and other culturally meaningful groupings.

The challenges implicit in either type of study remain owing to several factors. In terms of records, even where they once existed, they may be inaccessible, dispersed, incomplete, or destroyed (Grenham, 2006; Jolly, 2013; Wilkes, 2013). Even the most complete of records may intentionally or accidentally omit certain groups or individuals. Obstacles are also present where cemetery excavations are concerned. Many countries have different regulations preventing the removal of historic cemeteries, while others have even more limited publication than the United States and the United Kingdom (see Marquez-Grant & Fibiger, 2011). Other localities, such as Paris, relocated numerous historic cemeteries during the historical period itself, leaving no usable record (Cherryson et al., 2012; Baugher & Veit, 2014). As this work has demonstrated, the grey literature publication of many such reports continues to hamper data collection in this area. Despite these challenges, much can be achieved by pragmatic sampling of the aspects of these locales and records which are currently available for study.

However, such work cannot continue in earnest until archaeological reporting improves. The creation and standardization of guidelines for the excavation of historic cemeteries in the United States would be useful, despite the fact that the techniques which ought to be utilized in the study of historic cemeteries are fundamentally no different from those used on other sites with subterranean features, historic background, and osteological components (Buikstra & Ubelaker, 1994). Although not revolutionary, the creation of such a gold-standard would leave less room for archaeologists to excuse laxity in their practice, particularly in the field of CRM (King, 2005). In order to be effective, this must correspond with changes in federal law regarding the archaeological excavation of cemeteries. This is no small task. Current legal standards are insufficient across states to ensure the ethical treatment of remains as well as the collection of useful data for historic cemeteries. Yet financial, educational, and perceptual barriers continue to prevent the advancement of archaeology as a viable solution.

A Historic Graves Protection Act should focus on the mandatory reporting of inadvertent discoveries of human remains to the state archaeologist, and initial steps for their protection regardless of ethnicity, monumentalization, or land status. The age at which burials are considered historic should be
changed to 50 years, in keeping with standards for other historic designations under federal law (National Park Service, 2016a). Inventory and permitting processes should be improved to adequately involve interest groups in the decision-making process whenever a burial removal is contemplated. Penalties should be increased and standardized for the violation of these rules. Where archaeological intervention is deemed necessary, specialist involvement should be dictated. Recordation and reporting should adhere to the professional guidelines that already exist within archaeology (Buikstra & Ubelaker, 1994; Renfrew & Bahn, 2012). Publication and the filing of records should be mandatory and centralized. Ideally, funding schemes and administrative bodies should be identified to support such work. These already have their organizational shape in the form of the SHPOs (Olexa et al., 2006); the issue is more explicitly empowering such organizations to govern burial sites which currently fall outside of legal protection.

It is believed that only with the adoption of such standards will a change in behaviour and fundamental attitudes toward burial archaeology occur. The implementation of NAGPRA provides a good counterpoint to the conclusion that a federal Historic Graves Protection Act is necessary to foster the kind of attitudinal change required to truly improve the treatment of historic cemeteries: although many, even among the academic community, professed to respect the divergent beliefs and desires of Native cultures on a theoretical level before NAGPRA’s implementation, the treatment of Native dead did not truly begin to be commensurate until nearly a decade after forced compliance by the law (see Mihesuah (ed.), 2000; Fine-Dare (ed.), 2002; Charee & Lavallee (eds.), 2013). As with NAGPRA, resistance is to be expected from descendant groups who may be distrustful of archaeologists, construction interests and private land owners who want no additional hindrances on their activities or funds, and archaeologists themselves. Archaeologists may be concerned that lay perspectives will detract from the scientific rigor of their work (Meighan, 2000), or they may simply be set in the familiar routine of process.

Although daunting, such changes are in the best interests of multiple parties. The centralized role of archaeology would be good for archaeological professionals in that it would provide employment, and allow that work to be elevated to a higher standard. Furthermore, the data generated could be of real use to the profession at large, when it is more carefully obtained and finally made accessible for the long term. There are potential benefits for developers as well. Initial inventory efforts via records research, such as could be dictated by HGPA, would prevent the disturbance of many sites by simply bringing their existence back to recorded memory. If archaeological reporting is standardized, then cemeteries
may be identified and relocated once and for all, or at least anticipated by later construction projects. Increased regulations might mean that construction interests would consider whether relocating a cemetery was worth the costs in the first place. This would prevent them from having to choose between creating bad will among their consumers by doing slapdash burial removals or becoming entangled in never-ending projects as human remains continue to be discovered in a site that was poorly delineated in a lackadaisical initial survey. Unlike other archaeological sites, many people instinctively feel that there is impropriety in disturbing the dead, even if they are unrelated. As such, it is unlikely that public animosity will cease to dog developers until a greater attitude of consideration is adopted by the corporate culture.

Increased regulations would undoubtedly benefit the public, by giving more ethnic interests a voice in deciding what ought to happen to the restless dead. Whenever giving many parties a voice, it is inevitable that archaeological testing will not always be the result, and certain concessions may be required even in cases where it is. Some of these, such as requests for the use of non-scientific methods like dowsing, the inclusion of “superfluous” ritual, or prioritizing research agendas other than those favoured by the archaeologists, may rangle. However, it is important to remember that this is the only way to ensure that archaeologists also have an equal place at the table, rather than being constrained by corporate interests instead. Though archaeologists must hold their ground in ensuring the scientific method is carried out (Meighan, 2000), they must continue to learn to be flexible. As early points of contact and arbiters, the archaeological narrative would still benefit from professionally conducted cemetery delineations, even where no subsurface testing takes place. Trust is a two-way street: the public is more likely to grow receptive to different means of archaeological testing only once it has been habitually demonstrated to them that archaeologists are respectful of their views and their dead, and that information which is interesting and useful to them may be revealed by allowing increased testing.

As better standards are adopted, a number of studies could improve the practice of archaeology in historic cemeteries. First, the reliable identification of historic graves during initial cemetery testing is one major hindrance to the success of realistic project planning and sampling strategies. When graves are encountered unexpectedly, the natural desire may be to identify them as quickly as possible and move forward with the relocation. However, delineation methods may be variable in their ability to accurately predict the number of grave present (Robinson, 1996; Davenport, 2001; Atz & Weaver, 2006; Doolittle & Bellantoni, 2010; Heilen & Grey, 2010a; Matternes et al., 2012 a). This in turn results in false starts and erroneous beliefs that a cemetery has been “cleared”, only to encounter remains during a later
project. Surface scraping may not work where substantial fill has covered the cemetery or the soil is homogenously mottled. Test pits and auguring may not work if the depths of graves are highly variable. GPR and other ground penetrating technologies may not work well enough to define all graves where there are few dense objects, such as stones lining the graves. More testing is needed to devise a reliable strategy or combination of methods.

The current standards for osteological preservation are unreliable between sites (Brickley & McKinley, 2004). Although this is an issue throughout the field of human osteology, it could be resolved using data sets for historic cemeteries. A more mathematical metric, using visual recording based on artists’ proportions of the human body, would be one way to quantify how much of the bone surface is affected by different taphonomic changes. Converted into a quick recording app, automatic calculations could be done with little effort or user error, arriving at a convertible percent complete score. The issue of skeletal preservation ties neatly into the difficulties of accurately recording the complex spatial information present in human burials (Duday, 2006, 2009). New technologies such as photogrammetry can be used to take relatively rapid and accurate representations of the body in the burial environment. The integration of such technologies is key, as feature drawings of burials may be eschewed as too time-consuming, when the information they contain is very important. Not only does this help researcher understand the factors surrounding the specific burial environment such coffin collapse and flooding patterns, but this data can be used to answer the more universal question of how and why remains preserve or deteriorate in all burial environments. Once these recording methods are unified, specific studies are needed into soil acidity, grave depth, physical disturbances and other taphonomic factors in order to assess how preservation is affected. While several such studies have been done (e.g. Djuric et al., 2011), in addition to relying on an inherently unreliable preservation metric, they may also lack sufficient comparative data, the collection of which is currently considered excessive (e.g. location-specific soil acidity tests).

In general, the main hindrance to efficient historic cemetery excavation is the massive quantities of different types of data that must be quickly recorded and tracked. The use of basic computing is the way forward, whether it be the simple creation of Excel spreadsheets with automatic formulas for calculating data, or more advanced burial apps. Even if only partial sampling is planned, this is the key to speeding the excavation and analysis and making sure that no information is lost along the way. Typically, such streamlined processes have not been favoured over traditional paper forms unless an organization works with many burial projects and has the time to devote to the development of such a
Because of the increasing ease with which data systems may be created and the greater frequency of tablets in the field, it is hoped that more databases or apps specific to this purpose will emerge in the next few years. Once such systems are more widely standardized, then many possibilities will truly open in the discipline. These will include the opportunity to perfect studies of historic mortality, as well as numerous other topics, both osteological and historical.

One such question which has been made obvious by this work is the problem of under-aging the elderly in archaeological populations. While it has long been known that osteological techniques for aging adults becomes more unreliable around the age of 45 (Buikstra & Ubelaker, 1994), this study has illustrated the results of such under-aging at the population level. In the comparison of burial records to excavated burials at cemeteries like St. Benet Sherehog and Alameda Stone, it became obvious that the greatest distortions to the mortality profile were occurring among the elderly. This had the effect of making the maximum age of the population appear to be much younger than it actually was in some instances. Using mortality records and remains excavated from future cemeteries, it may be possible to develop superior aging techniques which resolve this discipline-wide problem.

Although much headway has been made in the understanding of historic infant mortality and infant survival in the burial environment, work still exists in these areas. In-depth studies of the communities included in this research could better tell the tale of the experience of childhood, parenthood, and grief in those locales. This in turn could shed light on why certain communities were healthier than others for the young. The question of what factors most affect infant preservation in the burial environment in ancient cultures is only imperfectly understood. While it seems that environmental influences alone are not to blame, something clearly contributes to infant and child loss in many barrows. As this study indicates that intrinsic chemical factors may not be the central problem, the recommendations of Duday should be pursued, in order to better understand the effects of physical displacement in the burial environment on infant survivability (2006, 2009). A first step in this process is a continuation of Buckberry’s work on burial depth and preservation, once more datasets exist with age by burial depth information (2000). Caves, barrows, and other ancient burial environments should be more thoroughly investigated, after preservation is better understood.

CONCLUDING REMARKS:

One of the behaviors that sets humanity apart from most other species is our ability to contemplate death and to show respect in our treatment of the dead. One of the gifts, or perhaps burdens,
that has been bestowed upon us courtesy of our ancestors’ struggle to ensure we survived to adulthood, is the idleness and the comfort to ponder the extent of our ethics. In western culture between the 18th and 21st centuries, respect for the dead has most typically been expressed by the interment and maintenance of graves, such as are to be found in historic cemeteries across America. There is an ethic too, in meeting the needs of the living, and allowing life to go forward. Towers must rise, schools, hospitals, and metros must be built and maintained. Wherever they must, it is important that as much as possible we respect the wishes of the dead and the reverence paid to them by the ones who laid them to rest. Archaeology allows us to do this, through mediation with living interests, and if necessary, the careful and delicate relocation of those who sleep beneath the soil. However, this is most true when we are faithful to the meticulousness that is the foundation of our practice, so that the foot falls of our own danse macabre disturb their slumber as little as possible.

Michel Foucault said, “As the archaeology of our thought easily shows, man is an invention of recent date. And one perhaps nearing its end.” Archaeological theories will rise and fall as surely as the people who gave them voice, but carefully recorded data is timeless. Most of all, it is hoped that this project has elucidated the need for more studies of this kind in order to promote the field of historical bioarchaeology, particularly in the area of osteological and cemetery research. With heightened and more consistent standards of data collection, research projects like this, as well as many others will be possible in the future.
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### APPENDIX A: Cemeteries Included in Publishing the Perished: Uniform Collection Standards and the Future of Historic Cemetery Excavation in the United States

<table>
<thead>
<tr>
<th>Big Neal Cove Cemetery, AL</th>
<th>Pine Ridge Cemetery, GA</th>
<th>Filhiol Mound Site, LA</th>
<th>Cockrill Bend Cemetery, TN</th>
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<tr>
<td>Elko Switch Cemetery, AL</td>
<td>Pleasant Hill Baptist Church, GA</td>
<td>1st Cemetery of New Orleans, LA</td>
<td>Wells Cemetery, TN</td>
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<td>Lucas Hill Cemetery, AL</td>
<td>Mt. Gilead Cemetery, GA</td>
<td>Horton Family Cemetery, LA</td>
<td>Waller Family Cemetery, TN</td>
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<td>Becky Wright &amp; Eddy Cemetery, AR</td>
<td>Vandworker Burying Ground, IL</td>
<td>Lane Memorial Hospital, LA</td>
<td>Providence Baptist Church, TN</td>
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<td>Court St Cemetery, AZ</td>
<td>Thurston Cemetery, IL</td>
<td>Uxbridge Almshouse, MA</td>
<td>Pioneer Cemetery, TX</td>
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<td>Alameda Stone Cemetery, AZ</td>
<td>Bowling Cemetery, IL</td>
<td>Cole Cemetery, MD</td>
<td>Tucker &amp; Sinclair Cemeteries, TX</td>
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<td>Los Angeles Cemetery, CA</td>
<td>Main Street Cemetery, IL</td>
<td>St. Francis Cemetery, MO</td>
<td>Adams Homestead, TX</td>
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<td>Manzanar Relocation Center, CA</td>
<td>Old Irish Cemetery, IL</td>
<td>Cope Family Cemetery, NC</td>
<td>Connally Cemetery, TX</td>
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<td>Madam Felix/Hettick Cemetery, CA</td>
<td>Stellwagon Cemetery, IL</td>
<td>Kearny Rd Cemetery, NM</td>
<td>Ivie Reservoir Cemeteries, TX</td>
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<td>7 Rivers Cemetery, NM</td>
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<td>Abejta Street, NM</td>
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<td>Obringer Cemetery, IL</td>
<td>TVI Site, NM</td>
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<td>Edwards-Attaway Cemetery, GA</td>
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<td>Fuller Cemetery, GA</td>
<td>Charity Hospital, LA</td>
<td>Ridley Graveyard, TN</td>
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## APPENDIX B: North American Cemetery Report Gazetteer

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<th>State</th>
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<th>Reference</th>
<th>Date Range</th>
<th>Year Excavated</th>
<th>Accessible for this study?</th>
<th>Age Groups Useful for this study?</th>
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</thead>
<tbody>
<tr>
<td>State</td>
<td>City</td>
<td>Cemetery/ Site Name</td>
<td>Reference</td>
<td>Date Range</td>
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<td>CA</td>
<td>Atascadero</td>
<td>Dove Cemetery</td>
<td>Sewell, 2008. Reflections on cultural identity at the edge of western expansion: the excavation and interpretation of Dove Cemetery, CA-SLO-1892H, San Luis Obispo County, California</td>
<td>~1830s-1900s</td>
<td>2004</td>
<td>Yes</td>
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<td>CA</td>
<td>Santa Clara</td>
<td>Santa Clara Valley Medical Center Potter’s Field</td>
<td>Full Report Forthcoming: Griffen, M. C.; Wilczak, C. A.; Bartelink, E. J. “Proposal for Long Term Study of the Human Skeletal Remains Recovered from the Santa Clara Valley Medical Center Potter’s Field.”</td>
<td>1875-1940</td>
<td>2013</td>
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<td>DE</td>
<td>Newcastle Co.</td>
<td>Woodville Site</td>
<td>Doms, K., A.; Hoseth, B. S.; Silber, D. J.; Grettler, S. M.; Gentile &amp; Faulls, F.D. 1995. &quot;Archaeological Investigations of the Scott’s Run Project Area, the Route 72/13 Intersection Improvements Project Area, and the Woodville Grave Site (7NC-E-98A), State Route 1 Corridor, New Castle County, Delaware.&quot; University of Delaware Department of Anthropology. Delaware.</td>
<td>1790-1880</td>
<td>1995</td>
<td>Yes</td>
<td>Yes</td>
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<td>DE</td>
<td>Bear</td>
<td>Partridge Family Cemetery</td>
<td>Traver, J. 2000. “Archaeological Excavation of the Partridge Memorial Cemetery, New Castle County, Delaware.” MAAR Associates, Inc. Newark, Delaware.</td>
<td>Late 1700s</td>
<td>1999</td>
<td>No</td>
<td>N/A</td>
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<td>DE</td>
<td>Sussex Co.</td>
<td>Oak Orchards</td>
<td>Parsons, D. Forthcoming via Smithsonian or Deldot.</td>
<td>1690-1750</td>
<td>2010, 2014</td>
<td>No</td>
<td>N/A</td>
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<td>DE</td>
<td>Dover</td>
<td>Lafferty Lane Cemetery</td>
<td>Bachman, D. C. &amp; Catts, W. P. 1990. “Final Archaeological Investigations of the Lafferty Lane Cemetery 7K-D-11, State Route 1 Relief Corridor, Dover, Kent County, Delaware.” University of Delaware Department of Anthropology. Wilmington: Deldot Series No. 80</td>
<td>1760-1840</td>
<td>1988</td>
<td>No</td>
<td>N/A</td>
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<td>DE</td>
<td>Georgetown</td>
<td>Collins-Jackson Family Cemetery</td>
<td>Rosenburg, K. 1995. &quot;Final Archaeological Excavations at a Late 18th Century Family Cemetery for the U. S. Route 113 Dualization Milford to Georgetown, Sussex County, Delaware.&quot; Louis Berger Group. Wilmington: Deldot Archaeology Series No 134.</td>
<td>1752-1799</td>
<td>1992</td>
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<td>FL</td>
<td>Tampa</td>
<td>Fort Brooke’s Cemetery</td>
<td>Piper, H. M. &amp; Piper, J. G. 1982. Archeological Excavations at the Quad Block Site, BH998., Located at the Site of the Old Fort Brooke Municipal Parking Garage, Tampa, Florida. Manuscript on File, Department of Public Works, City of Tampa.</td>
<td>1825-1838</td>
<td>1980</td>
<td>No</td>
<td>N/A</td>
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<td>Clark Co.</td>
<td>Sandy Creek Cemetery</td>
<td>Garrow, P. H. 1990. “Archaeological Investigations of the Sandy Creek Cemetery, Lot 31, Block “b”, Sandy Creek Estates, Clark County, Georgia” Garrow &amp; Associates, Inc. Atlanta, Georgia.</td>
<td>1841-1920</td>
<td>1990</td>
<td>Yes</td>
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<td>GA</td>
<td>Duluth</td>
<td>Pleasant Hill Baptist Church</td>
<td>Wilson, K. 1998. &quot;Results of Disinterment/Reinternment of the Final 13 Graves at Pleasant Hill Baptist Church Cemetery, Duluth, Georgia&quot; TRC Garrow &amp; Associates. Atlanta, Georgia.</td>
<td>1950s-1980s</td>
<td>1998</td>
<td>Yes</td>
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<td>GA</td>
<td>Brunswick</td>
<td>Wright Square Burial Ground</td>
<td>Weeks, W. M. &quot;Wright Square Burial Ground, Brunswick, Georgia (9GN407): A Voyage of Discovery and Learning.&quot; South Carolina Institute of Archaeology and Anthropology.</td>
<td>1771-1840</td>
<td>2012</td>
<td>No</td>
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<td>GA</td>
<td>Chamblee</td>
<td>Nancy Creek Primitive Baptist Cemetery</td>
<td>Garrow, P.; Symes, S. A.; &amp; Case, H. W. 1985. “Physical Anthropology and Archaeological Investigations of the Nancy Creek Primitive Baptist Church Cemetery, Chamblee, Georgia.” Garrow and Associates: Atlanta.</td>
<td>1850s-1979</td>
<td>1984</td>
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<td>IN</td>
<td>Michigan City</td>
<td>Michigan City Old Graveyard (12LE348)</td>
<td>Strezewski, M. 2003. &quot;Ellen We Miss Thee at Home&quot;: Archaeological Investigations at the Michigan City Old Graveyard (12Le348), LaPorte County, Indiana. Reports of Investigations 308. IPFW Archaeological Survey. Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana.</td>
<td>1836-1864</td>
<td>2003</td>
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<td>KY</td>
<td>Louisville</td>
<td>Manslick Road Medical School</td>
<td>University of Louisville Field School, Referenced in Spencer, S. D. 2002. &quot;Manslick Road Cemetery, Burial No. 34&quot;. Unpublished Paper, University of Louisville.</td>
<td>1907-1910</td>
<td>2001</td>
<td>Yes</td>
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<td>LA</td>
<td>East Baton Rouge</td>
<td>Lane Memorial Hospital</td>
<td>Coxe, C. L.; Manhein, M; Austin, W. J.; &amp; Ryan, J. 1997. &quot;Disinterment of Nineteenth Century Burials at Lane Memorial Hospital Cemetery (16EBR152) Zachary, East Baton Rouge Parish, Louisiana.&quot; Coastal Environments Inc. Baton Rouge, Louisiana.</td>
<td>Mid to Late 19th C.</td>
<td>1995</td>
<td>Yes</td>
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<td>LA</td>
<td>Grand Ecore</td>
<td>Fort DeRussy Cemetery</td>
<td>Mayeux, S. M. Earthen Walls, Iron Men: Fort DeRussy, Louisiana, and the Defense of Red River. Knoxville: University of Tennessee Press.</td>
<td>Mid to Late 1800s</td>
<td>1999</td>
<td>No</td>
<td>N/A</td>
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<td>LA</td>
<td>Baton Rouge</td>
<td>State Capitol Old Military Cemetery</td>
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<td>1822-1879</td>
<td>1931</td>
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<td>LA</td>
<td>E Feliciana Co.</td>
<td>Port Hudson Military &amp; Civilian Cemetery</td>
<td>Manhein, M. A. &amp; Whitmer, A. M. “Investigations of the Port Hudson Military and Civilian Cemeteries (16EF68).” Department of the Interior Reports.</td>
<td>?</td>
<td>1988</td>
<td>No</td>
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<td>MA</td>
<td>Deer Island</td>
<td>Piggery Point Burials</td>
<td>King, M. A. &amp; Miller, B. P. 1991. Archaeological Investigations, Haul Road Trenching, and Disturbance Documentation of the Piggery Point Burials on Deer Island, Boston, Massachusetts. The Public Archaeology Laboratory, Inc., Pawtucket, Rhode Island. Submitted to Massachusetts Water Resources Authority, Boston, Massachusetts.</td>
<td>1840-1890</td>
<td>1990</td>
<td>No</td>
<td>N/A</td>
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<td>MA</td>
<td>Littleton</td>
<td>Lucy Kimball Mead Tomb</td>
<td>Sutherland, F. 2006. Use, Reuse, and Desecration: Analysis and Interpretation of the Lucy Kimball Mead Tomb, Littleton, Massachusetts. Bachelor's thesis, Boston University, Boston, Massachusetts.</td>
<td>1822-1852</td>
<td>2000-2003</td>
<td>No</td>
<td>N/A</td>
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<td>MD</td>
<td>St. Mary’s City</td>
<td>St. Mary's Chapel</td>
<td>“Project Lead Coffins: The Search for Maryland’s Founders, an Interdisciplinary Inquiry.” Historic St. Mary’s City. <a href="http://www.hsmcdigshistory.org/research/publications/">http://www.hsmcdigshistory.org/research/publications/</a></td>
<td>1670s-1680s</td>
<td>1990</td>
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<td>MD</td>
<td>Patuxent</td>
<td>Patuxent Point (18CV271)</td>
<td>King &amp; Ubelaker 1996. Living and Dying on the 17th Century Patuxent Frontier. The Maryland Historical Trust Press, Crownsville, Maryland.</td>
<td>1658-1680s</td>
<td>1989-1990</td>
<td>No</td>
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<td>MD</td>
<td>Frederick Co.</td>
<td>Catocin Furnace Cemetery</td>
<td>Burnston, S. A. &amp; Thomas, R. A. 1981. Archaeological Data Recovery at Catocin Furnace Cemetery, Frederick County, Maryland. MidAtlantic Archaeological Research, Inc., Newark, Delaware. Submitted to Orr and Son, Consulting Archaeologists for Maryland Department of Transportation.</td>
<td>1790-1840</td>
<td>1979-1980</td>
<td>No</td>
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<td>NC</td>
<td>Raleigh</td>
<td>Cope Family Cemetery</td>
<td>Garrow, P. H. 1993. “Subject: Results of Monitoring the Relocation of the Cope Family Cemetery, Raleigh, North Carolina” Garrow &amp; Associates, Inc. Atlanta, Georgia.</td>
<td>~1870-1900</td>
<td>1993</td>
<td>Yes</td>
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<td>NM</td>
<td>Albuquerque</td>
<td>San Felipe De Neri</td>
<td>Osterholtz, A.; Railey, J. A.; &amp; Ballagh, J. 2006 Monitoring and Excavations for a Proposed Remodeling of the Sister Blandina Convento Courtyard, San Felipe de Neri Church (LA 8872), Bernalillo County, New Mexico. SWCA Cultural Resources Report No. 2005594 (NMCIRS 96848)</td>
<td>1706</td>
<td>1970s, 2005</td>
<td>Yes</td>
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<td>NM</td>
<td>Las Vegas</td>
<td>Las Vegas Gravel Pit Cemetery</td>
<td>Mills, E. S. 1979. Graves in the Gravel: The Unmarked Cemetery of Las Vegas, New Mexico Master’s thesis, New Mexico Highlands University, Las Vegas, New Mexico Company</td>
<td>1880s-1940s</td>
<td>1972</td>
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<td>Seacaucus</td>
<td>Seacaucus Potter’s Field/Snake Hill</td>
<td>Forthcoming, Excavated by Louis Berger &amp; Monmouth University</td>
<td>1880-1962</td>
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<td>Buffalo</td>
<td>Buffalo Potter’s Field</td>
<td>Morell, K. 2011 “The Relocation of the Buffalo Potter’s Field at City Honors School, Buffalo, New York.” Session presented at the Council for Northeast Historical Archaeology Conference, Utica, NY, October 23.</td>
<td>1832-1885</td>
<td>2007</td>
<td>No</td>
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<td>OH</td>
<td>Butler</td>
<td>Hosier Family Cemetery</td>
<td>Lee, A. B. 2002. Report of Field Investigations for the Relocation of the Hosier Family Cemetery, Butler Township, Montgomery County, Ohio, MOT-75-3.842 (PID19070). Hardlines Design Company, Columbus, Ohio. Submitted to Paul Graham, Assistant Environmental Administrator, Ohio Department of Transportation, Office of Environmental Services, Columbus, Ohio.</td>
<td>1846-1870</td>
<td>2002</td>
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<td>State Institutions</td>
<td>Waller, J. N. &amp; Hubbard, M. J. 2012. “‘Laid in the Alien Soil of the Potters Field’: Life and Death at the Rhode Island State Institutions 1887-1918.” Ridot Archaeology Series No 156. V I-II; PAL Publications.</td>
<td>1887-1918</td>
<td>2006</td>
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<td>SC</td>
<td>Charleston Co.</td>
<td>Youghal Plantation Cemetery</td>
<td>Trinkley, M. 2003. “Management Summary of Data Recovery Excavations at 38CH932, Youghal Plantation, Charleston County, South Carolina.” Chicora Research Contribution 398.</td>
<td>~1750s</td>
<td>2003</td>
<td>No</td>
<td>N/A</td>
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<td>SD</td>
<td>Gregory Co.</td>
<td>Scisson Family Cemetery</td>
<td>Berg, R. E. 1990. An Investigation of Burials at the Scisson Family Cemetery in Gregory County, South Dakota. South Dakota Archaeology 14(36-92).</td>
<td>1862-1911</td>
<td>1982</td>
<td>No</td>
<td>N/A</td>
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<td>TN</td>
<td>Davidson Co.</td>
<td>Waller Family Cemetery</td>
<td>King, M. 2005. “Archaeological Disinterment of the Waller Family Cemetery, Site 40DV593, Davidson County, Tennessee” AMEC Earth and Environmental. Louisville, Kentucky</td>
<td>Late 19th – Early 20th C.</td>
<td>2005</td>
<td>Yes</td>
<td>Yes</td>
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<td>State</td>
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<td>TX</td>
<td>Corsicana</td>
<td>Montgomery Hill Cemetery</td>
<td>Feit, R. &amp; Trask, W. 2013. “Into the Afterlife: Archaeological Excavations and Analysis of Human Remains at the Montgomery Hill Cemetery (41NV716), Navarro County, Texas.” AmaTerra Environmental. Austin, Texas.</td>
<td>~1880</td>
<td>2010</td>
<td>Yes</td>
<td>Yes</td>
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<td>State</td>
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<td>TX</td>
<td>Laredo</td>
<td>Laredo Cemetery</td>
<td>McReynolds, M. J. 1981. “Archeological Investigations at the Laredo Cemetery Site (41WB22), Webb County, Texas.” Prewitt and Associates Reports.</td>
<td>1880-1920</td>
<td>1980</td>
<td>No</td>
<td>N/A</td>
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<td>TX</td>
<td>Bastrop Co.</td>
<td>Morgan Chapel Cemetery</td>
<td>Taylor, A. J; Fox, A. A.; &amp; Cox, I. W. 1986. “Archaeological Investigations at Morgan Chapel Cemetery (41BP200), A Historic Cemetery in Bastrop County, Texas.” University of Texas at San Antonio Center for Archaeological Research.</td>
<td>1891-1924</td>
<td>1984</td>
<td>No</td>
<td>N/A</td>
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<td>VA</td>
<td>Richmond</td>
<td>Quantico Center</td>
<td>Ezell, R. D. &amp; Huston, C. 2006. &quot;Archaeological Removal of Five Historic Burials from Site 44ST0623 at the Quantico Corporate Center Tract Stafford County, Virginia.” ECS Mid-Atlantic, LLC. Fredericksburg, Virginia.</td>
<td>1850-1900</td>
<td>2006</td>
<td>Yes</td>
<td>Yes</td>
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<td>VA</td>
<td>Henrico Co.</td>
<td>Woodstock Plantation/Selden Farm Cemetery</td>
<td>McDonald, B., &amp; Meacham, S. 2001. “Archaeological Excavation of an Unmarked Cemetery at Site 44HE950 at the Confederate Forest Development, Henrico County, Virginia” Gray &amp; Pape, Inc. Richmond, Virginia.</td>
<td>Late 18th – Late 19th C.</td>
<td>1997</td>
<td>Yes</td>
<td>Yes</td>
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<td>VA</td>
<td>Sykesville</td>
<td>Sykesville Law Enforcement Facility Site</td>
<td>Slaughter, B. &amp; Manning-Sterling, E. H. 2001. &quot;Data Recovery at 18CR239, the Sykesville Law Enforcement Driver Training Facility, Sykesville, Carroll County, Maryland.&quot;</td>
<td>1790-1825</td>
<td>2001</td>
<td>No</td>
<td>N/A</td>
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<td>VA</td>
<td>Charlottesville</td>
<td>Venable Lane Cemetery</td>
<td>Grey, A. E.; Patten, M. D &amp; Warner, M. S. 1993. A Preliminary Archaeological Assessment of the Venable Lane Site. University of Virginia, Department of Anthropology. Submitted to the Facilities Planning and Construction Department, Facilities Management, University of Virginia.</td>
<td>1860-1900</td>
<td>1993</td>
<td>No</td>
<td>N/A</td>
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<td>VA</td>
<td>Hanover Co.</td>
<td>Summer Duck Farm Site</td>
<td>Forthcoming, Browning and Associates Prepared for Summer Duck Company</td>
<td>?</td>
<td>2015</td>
<td>No</td>
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<td>Ontario, Canada Stirrup Court Cemetery</td>
<td>Woodley, P. J. 1992. The Stirrup Court Cemetery Coffin Hardware. Ontario Archaeology 53:45-63.</td>
<td>1840-1890</td>
<td>1892</td>
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<td>Ontario, Canada</td>
<td>St. Thomas Belleville</td>
<td>Analysis of Patterns of Injury and Disease in an Historic skeletal sample from Belleville, Ontario Master’s Thesis; MacMaster University</td>
<td>1821-1874</td>
<td>1989</td>
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<td>Quebec, Canada</td>
<td>Temiscaming Cemetery</td>
<td>Excavated by Tembec</td>
<td>~1891</td>
<td>Ongoing</td>
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<td>Quebec, Canada</td>
<td>Trois Riviers Cemetery</td>
<td>Excavated for Hydro Quebec</td>
<td>1710-1865</td>
<td>2004, 2011, 2012</td>
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<td>Quebec, Canada</td>
<td>Basilique de Notre Dame St Famile</td>
<td>Ville de Québec, «Recherches archéologiques sur le site de la chapelle Mgr de Laval à la basilique de Québec*, document inédit, Division du design et du patrimoine, Service de l’urbanisme, 1995</td>
<td>?</td>
<td>1995</td>
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<td>Quebec, Canada</td>
<td>St. Anne</td>
<td>Ville de Québec, «Recherches archéologiques sur le site du cimetière Sainte-Anne (CeEt-36) », document inédit, Centre de développement économique et urbain, Division design et patrimoine, 1996.</td>
<td>1691-1844</td>
<td>1996</td>
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<td>Quebec, Canada</td>
<td>St. Matthew</td>
<td>?</td>
<td>1771-1860</td>
<td>2008</td>
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APPENDIX C: Mortality Tables

Figure 1: Percent Mortality by Age Group in 23 British Cemeteries (Ascending Child Mortality)
Figure 6: Percent Child Mortality in 23 British Cemeteries
Figure 3: Percent Infant Mortality in 23 British Cemeteries
Figure 7: Percent Mortality by Age Group Aggregated by US State, for 18 States
Figure 8: Percent Infant Mortality Aggregated by US State, for 18 States
Figure 11: Percent Child Mortality by US Cemetery for 50 Cemeteries

Children
Figure 12: Percent Mortality by Age Group in US Cemeteries with >100 Sample Size
Figure 13: Percent Mortality by Age Group in US Cemeteries in the South

![Bar chart showing mortality by age group in US cemeteries in the South.](chart)

**South**
- 1st Cemetery of St Peter, LA (N=29)
- Becky Wright Cemetery, AR (N=10)
- Filhiol Mound, LA (N=16)
- Lane Memorial Hospital, LA (N=13)
- Eddy Cemetery, AR (N=16)
- Big Neal Cove Cemetery, AL (N=68)
Figure 14: Percent Mortality by Age Group in US Cemeteries in the Southeast

Southeast

- Roughton Brown Cemetery, GA (N=14)
- Hampstead Cemetery, SC (N=344)
- Mason Cemetery, TN (N=35)
- Campbell County Cemetery, TN (N=15)
- Shockley Cemetery, GA (N=18)
- Son Cemetery, SC (N=11)
- Fuller Family Cemetery, GA (N=44)
- Read Family Cemetery, TN (N=27)
- Richmond County Cemetery, GA (N=11)
- Ridley Cemetery, TN (N=47)
- Pine Ridge Cemetery, GA (N=14)
Figure 15: Percent Mortality by Age Group in US Cemeteries in the Midatlantic

- Weir Family Cemetery, WV (N=24)
- Wrenn Hutchinson Cemetery, VA (N=43)
- Bennett Cemetery, KY (N=56)
- Guinea Rd Cemetery, VA (N=34)
- Horse Park Cemetery, KY (N=31)
- Oliver Family Cemetery, VA (N=10)
- Evans Cemetery, WV (N=101)
- Reynold's Cemetery, WV (N=32)
- Branham Cemetery, KY (N=24)
Figure 16: Percent Mortality by Age Group in US Cemeteries in the Northeast

Northeast

- Blanchard Cemetery, RI (N=11)
- State Institutional Ground, RI (N=60)
- Woodville Cemetery, DE (N=10)
- Shippenville Cemetery, PA (N=28)
- Voegly Cemetery, PA (N=555)
Figure 17: Percent Mortality by Age Group in US Cemeteries in the Southwest

Southwest

- Dawson Cemetery, TX (N=63)
- 7 Rivers Cemetery, NM (N=45)
- Alameda Stone Cemetery, AZ (N=1166)
- Adam’s Family Cemetery, TX (N=11)
- Coffey & Boothill Cemetery, TX (N=15)
- Kearny Rd Cemetery, NM (N=21)
- Tucker & Sinclair Cemetery, TX (N=12)
Figure 18: Percent Mortality by Age Group in US Cemeteries in the Midnorthern States

Midnorth

- Thurston Cemetery, IL (N=21)
- Grafton Cemetery, IL (N=163)
- Douthitt Cemetery, IN (N=11)
- Stellwagen Cemetery, IL (N=15)
- Bowling Cemetery, IL (N=199)
- St. Regis Cemetery, MO (N=42)
- Dubque 3rd St, IA (N=811)
- Vandawerker Burials, IL (N=11)
- Old Irish Cemetery, IL (N=13)
- Mitchell Rd Cemetery, IL (N=15)
Figure 19: Percent Mortality by Age Group in US Cemeteries in the West Coast States

West Coast

- LA Cemetery, CA (N=31)
- Collings & Watkins Cemetery, OR (N=10)
Figure 17-23: Mortality Profiles (Percent) by Age Group in UK Cemeteries

**City Bunhill Burial Ground, London (N=239)**

**New Churchyard Broadgate, London (N=142)**
St. Peter, Wolverhampton (N=149)

Carver St Methodists, Sheffield (N=130)
Kingston on Thames Quakers, Kingston upon Thames (N=360)

St Peter Le Bailey, Oxford (N=172)
St. Hilda, South Shields (N=183)

Crossbones Burial Ground, London (N=148)
Figure 24-42: Mortality Profiles (Percent) by Age Group in US Cemeteries

Hampstead Cemetery, SC (N=344)

Branham Cem, KY (N=24)
LXVI
1st Cemetery of St Peter, LA (N=29)

Grafton Cemetery, IL (N=162)
Wrenn-Hutchinson Cemetery, VA (N=43)
APPENDIX D: Curriculum Vitae
AMANDA LAUREN MURPHY

EDUCATION

PhD: Computational Biology & Bioarchaeology, University of Manchester, UK, expected 2016
MS: Human Osteology & Funerary Archaeology, 1st Distinction, University of Sheffield, UK, 2009
BA: Archaeology, Suma Cum Laude (subject), Cum Laude Columbia University, New York, 2006

FIELDWORK

Nov 2015 –  Present National Park Service: Yosemite National Park
Mariposa County, California.
GS-07 Term Archaeological Technician. As Project Archaeologist, oversaw multiple field and laboratory projects, participating in planning, completing field work, completing reporting, and archiving materials. Hired and coordinated volunteers and GS-05s. Oversaw field crews. Acted as a Human Osteologist in projects which took place in sensitive areas, and in instances of potential inadvertent discovery. Acted as Field and Lab technician on excavations, monitoring, projects, and surveys. Used GIS, ASMIS, Excel, and Access to complete multiple projects.

Summary of Field Projects for Yosemite

2015-16 Facelift 2015 Post Season Analysis & Reporting
Project Archaeologist. Analyzed historic artifacts inadvertently collected by visitors. Completed reports and updated site information. Took artifact photos and managed project photolog. Used GIS to update project maps. Coordinated with museum staff in order to curate artifacts. Archived materials and records.

2016 Emergency Services Complex Excavation & Monitoring

2016 Visitor Use Impact Project 2015 Post Season Analysis & Reporting
Project Archaeologist. Completed reports and updated site information. Used GIS to update project maps. Used Access, Excel, Acrobat, and ASMIS to update site information.

2016 Visitor Use Impact Project 2016 Pre-Season Planning
Project Archaeologist/Archaeological Technician. Updated site sample selection system.
Organized and updated site records using Access, GIS, Word, Excel, and ASMIS. Planned and coordinated summer field work. Participated in the crew selection process. Participated in interdisciplinary meetings guiding the direction of the project.

2016  Facelift 2016 Pre-Season Planning  
*Project Archaeologist/Archaeological Technician.* Coordinated with other branches and Yosemite Rock Climber’s Association in order to plan the annual, large-scale trash collection event involving thousands of volunteers. Hired volunteers. Coordinated logistics for volunteers’ fieldwork and upkeep. Participated in interdisciplinary meetings guiding the direction of the project.


Feb – Mar 2013  Al Hajar Project  
Bahlah Oasis, Oman.  
*Osteologist.* Analyzed a large assemblage of comingled human remains from 1980s seasons of excavated Beehive tombs for age, sex, cultural affiliation, metric, nonmetric and pathology data.

*GS-07 Seasonal Archaeological Technician.* Monitored park archaeological sites, using GIS and

Nov 2010 – Jan 2012 **Ecological Communications Corporation.** Travis County, Texas.
(40-80 hr/wk) **Lab Director, Project Archaeologist, & Osteologist.** Supervised & assisted lab technicians in the analysis of artifacts and samples from reception to curation. Managed and executed field projects. Ensured NAGPRA compliance through osteological identification of any ambiguous remains.

**Summary of Field Projects for EComm**

Project Archaeologist & Human Osteologist. Oversaw the excavation of 25 historic graves from a cemetery partially submerged by the creation of the Richland Chambers Reservoir, at the behest of TRWD in compliance with NHPA, ACT, and NAGPRA.

2011 **EComm 178-003.** Ellis & Johnson Counties, Texas.
Archaeological Technician. Surveyed & sampled 8,027 acres for NHPA and ACT compliance on the Integrated Water Pipeline on behalf of Freese Nichols.

2011 **EComm 011-041: 41BX256.** Bexar County, Texas.
Archaeological Technician. Excavated an archaic campsite for Section 106 compliance in anticipation of river bank stabilization (SARIP) under the auspices of SARA and USACE. Completed plan and profile drawings, took resistivity readings, and as **Lab Director,** oversaw the collection of artifacts and samples to curation specifications.

2011 **EComm 046-034.** Ellis County, Texas.
Archaeological Technician. Surveyed & sampled 46 acres at Waxahachie Creek Park on Bardwell Lake for Section 106 and NHPA compliance, on behalf of USACE. As Osteologist, differentiated between human and animal remains to ensure NAGPRA compliance.

Sep – Nov 2010 **HDR e2M. BP Gulf Recovery Project.** Various counties of Alabama & Mississippi. Archaeological Technician. Used GIS to monitor & survey sites of cultural sensitivity in order to advise NEPA Shoreline Treatment Assessments.

Jun – Aug 2010 **National Park Service: Big Bend National Park.** Brewster County, Texas. GS-07 Archaeological Technician. Designed & implemented a GIS ground & aerial survey of archaeological resources within the Park for UDA activity.

Feb – Mar 2010 **CBBS Pinto Canyon Survey.** Brewster County, Texas.  
(60 hr/wk) *Archaeological Technician.* Conducted GIS survey of midden sites at Pinto Canyon Ranch for the Center for Big Bend Studies.

February 2010 **CBBS Birthday Site Excavation.** Brewster County, Texas.  
(60 hr/wk) *Archaeological Technician.* Excavated an Early Archaic campsite, conducted by the Center for Big Bend Studies. Took photos and did plan and profile drawings.

Jun – Jul 2009 **Stonehenge Riverside Project.** Wiltshire, United Kingdom.  
(60 hr/wk) *Human Osteologist & Technician.* Excavated Bluehenge for the University of Sheffield and Bradford University. Identified ambiguous skeletal remains.

June 2009 **Brodsworth Hall Excavation.** West Yorkshire, United Kingdom.  
(10 hr) *Human Osteologist.* Assisted in the extraction of single Bronze Age burial, during the course of undergraduate field school conducted by the University of Sheffield.

May 2009 **York-Barbican Center Excavation.** West Yorkshire, United Kingdom.  
(10 hr) *Human Osteologist & Technician.* Recovered human remains as part of a post-excavation site sterilization of Medieval church & graveyard, conducted by the University of Sheffield & ARCUS.

April 2009 **National Trust Beeston Tor Excavation.** West Yorkshire, United Kingdom.  
(60 hr/wk) *Crew Chief & Human Osteologist.* Supervised undergraduates in the excavation and analysis of multiple Neolithic cave burials.

Jun – Aug 2008 **National Park Service: Big Bend National Park.** Brewster County, Texas.  
(40 hr/wk) *GS-07 Seasonal Archaeological Technician.* Worked with GIS, Excel, & ASMIS to digitize archaeological site information, conducting extensive field survey to fill in missing data.

June 2008 **CBBS Goode Ranch Assessment Survey.** Brewster County, Texas.  
(30 hr) *Archaeological Technician.* Surveyed private land at the behest of the Center for Big Bend Studies for damage to cultural resources for insurance claims.

Feb – Apr 2008 **CBBS Big Bend National Park Survey Project.** Brewster County, Texas.  
(60 hr/wk) *Crew Chief.* Supervised one of two teams for Center for Big Bend Studies during largest pedestrian GIS survey ever conducted of the Big Bend National Park.

(10 hr/wk) *Anthropological Technician.* Worked in Hazmat under security clearance to screen asbestos contaminated materials from the World Trade Center for human remains and personal effects.

March 2006 **Seneca Village Project.** New York County, New York.  
(16 hr/wk) *Archaeological Technician.* Conducted augur tests, surveying, & mapping site of Seneca Village under the auspices of the Seneca Village mapping project.

LXXVI
May – Jul 2005 **Pambamarca Archaeological Project.** Quito, Ecuador.
(60 hr/wk) *Archaeological Technician.* Participated in Phase III excavation of Pre-conquest fort.

Jan – Mar 2005 **Amheida Excavations.** Dahkleh, Egypt.
(40 hr/wk) *Archaeological Technician.* Participated in Phase III excavation of continuously occupied Old Kingdom – Christian period town & temple.

(16 hr/wk) *Archaeological Technician.* Conducted auger tests, surveying, & mapping site of Seneca Village under the auspices of the Seneca Village mapping project.

**LAB, MUSEUM, & FINE ART EXPERIENCE**

Nov 2010 – Jan 2012 **Ecological Communications Corporation.** Travis County, Texas.
(40-80 hr/wk) *Lab Director, Project Archaeologist,* & *Osteologist.* Supervised & assisted lab technicians in the analysis of artifacts and samples from reception to curation. Managed and executed field projects. Ensured NAGPRA compliance through osteological identification of any ambiguous remains.

**Summary of Lab Projects for EComm**

2011  
**EComm 046-035.** Bowie & Cass Counties, Texas.  
*Lab Director.* Managed the recording, analysis, and curation of artifacts from survey and shovel testing of 1,161 acres around Lake Wright Patman on behalf of USACE.

2011  
**EComm 153-006: 41TV2385.** Travis County, Texas.  
*Lab Director.* Managed records curation for scraping and excavation of 41TV2385 in compliance with the ACT and NHPA.

2011  
**EComm 011-041: 41BX256.** Bexar County, Texas.  
*Lab Director.* Oversaw flotation, pH testing, and sampling. Organized and managed the recording, analysis, and curation of artifacts from the site revisit for Section 106 compliance in anticipation of river bank stabilization (SARIP) under the auspices of SARA and USACE.

2011  
**EComm 062-020B: 41DW277.** DeWitt County, Texas.  
*Lab Director.* Oversaw the flotation of samples and curation preparation of artifacts and records pursuant to archaeological investigations in order to determine NRHP and SAL eligibility.

2011  
**EComm 046-032.** Bell County, Texas.  
*Lab Director.* Oversaw the curation of records associated with Section 106 survey of 6,297 acres of Lake Belton shoreline under NHPA for USACE.

2011  
**EComm 011-038: 41BX254, 41BX256, 41BX1628.** Bexar County, Texas. *Lab
**Director.** Oversaw the recording, analysis, and curation of artifacts from the survey of 3 sites for Section 106 compliance in anticipation of river bank stabilization (SARIP) under the auspices of SARA and USACE

2011 **EComm 100-06, 10: 8 Sites in Landa Park.** Comal & Guadalupe Counties, Texas. **Lab Director.** Oversaw the curation of artifacts and records associated with exploratory survey, trenching, shovel & auger testing at Landa Park, conducted for bank stabilization and irrigation installation on behalf of Halff Associates.

2011 **EComm 083-016: 250 Reservoir Sites in Oklahoma.** LeFlore, Sequoyah, Muskogee, Haskell, Cherokee, McIntosh, & Pittsburg Counties, Oklahoma. **Lab Director.** Conducted artifact analysis and oversaw the preparation and curation of artifacts and documents associated with Section 110 Compliance shovel testing of 250 reservoir-adjacent sites in Oklahoma for the Tulsa District Corps of Engineers.

2010 **EComm 062-028B: 41DL436.** Dallas County, Texas. **Lab Director.** Organized and oversaw flotation, sample sorting, wet-screening, and the washing and preparing of artifacts for curation in association with excavations conducted on behalf of the Texas Department of Transportation for expansion of IH20 in compliance with NHPA and ACT.

2010 **EComm 046-22, 24, 25, 26, 27, 29, 30.** Angelina, Bowie, Nacodoches, Jasper, San Augustine, & Tyler Counties, Texas. **Lab Director.** Oversaw the curation of records associated with the survey & testing of six localities in the Piney Woods area on behalf USACE.

2010 **EComm 153-003.** Travis County, Texas. **Lab Director.** Oversaw the curation of records associated with the survey of the Waller Creek Tunnel for NHPA compliance, undertaken for Baer Engineering.

Dec – Jan 2009 **HDR: 44CF568.** Chesterfield County, Virginia. (60 hr/wk) **Lab Technician.** Analyzed artifacts from the excavation of the Defense Supply Center Richmond, undertaken for the ACE and DOD, and recorded findings in Excel.

Sept – Apr 2008 **York-Barbican Project Post Excavation.** West Yorkshire, United Kingdom. **Lab Technician.** Prepared human remains for analysis and curation, taking samples for DNA and isotopic analysis on behalf of the York-Barbican Venture.

Feb – May 2008 **Stonehenge Riverside Project Post Excavation.** Wiltshire, United Kingdom. **Lab Technician.** Prepared human & faunal cremains for analysis and curation. Sorted lithics from >5 mm sieving.

Oct – Jan 2007 **Brooklyn Museum.** Kings County, New York. (10 hr/wk) **Curatorial Conservation Intern.** Constructed storage for monumental works of art & chemical library, & managed x-radiograph archive.

Aug 2006 – Christie’s Inc. New York County, New York. May 2007 Property Controller. Was responsible for monitoring all artwork of all mediums, up to 4 million dollars, for over 20 departments, within five storage facilities. (40-60 hr/wk)


TEACHING, INTERPRETATION, & YOUTH EXPERIENCE

- Biological Anthropology of the Human Skeleton, University of Manchester 2014 Senior BS level course
- Anatomical Sciences Field Course, University of Manchester 2015 MS level course
- Meet the Expert, ThinkTank Birmingham Science Museum 2014 Interpretive Biological Anthropology program for ages 4-14
- Acoma Hiking Club Leader, National Park Service Summer 2012-2015 Hike leader, resources & traditional tool technologies program for ages 6-16
- Interpretive Programs (aid), National Park Service Summer 2008, 2010, 2012-2015 Acting Interpretive Ranger, providing assistance and information to visitors of all ages
PROFESSIONAL ASSOCIATIONS

• Society of American Archaeologists (SAA), Since 2014
• American Association of Physical Anthropologists (AAPA), Since 2014
• Register of Professional Archaeologists (RPA), Since 2010
• American Anthropological Association (AAA), 2010

CERTIFICATIONS & TRAINING

• Society for Historical Archaeology Workshops, Bioarchaeology Workshop, January 2014
• National Park Service Cave Search and Rescue Basic Training, 2015
• National Park Service Class A Sawyer Training, August 2013
• National Park Service Hazcom Certified, July 2012
• National Park Service Helicopter Flight Training, 23 Hours logged July 2010
• OSHA Certifications Hazwoper Certified, October 2010
• REC Emergency First Aid, United Kingdom, November 2014
• American Heart Association, CPR & First Aid Certified, August 2010, 2013, 2015
• NYU School of Continuing and Professional Studies, U.S.P.A.P. Certified, March 2006
• Office of the Chief Medical Examiner, NY, Hazmat Certified, November 2007
• PADI Open Water & Deep Water Diver Certified. 1998

CONFERENCE PRESENTATIONS


2015 “Missing, Presumed Dead: Deconstructing “high” infant mortality using new data sets from historical cemeteries.” Poster Presentation for the American Association of Physical Anthropologists, St Louis Missouri, March 2015


2014 “Lost, But Not Alone: Burial records as a means of determining absolute taphonomic loss by age in cemetery populations.” Conference for Cultural Heritage and New Technologies, Vienna Austria, November 2014

2014 (Co-authored with Andrew Chamberlain.) “Looking Forward to Look Back: How investigations of historical burial populations can inform our interpretations of prehistoric burial practice.” Invisible Dead Conference, Durham University, June 2014
PUBLICATIONS

Forthcoming

Forthcoming
“Hollowed Ground: Where destruction becomes respect in bioanthropology.”

Forthcoming
“Publishing the Perished: Uniform collection standards and the future of historical cemetery excavations in the United States.”

In Press
(Co-authored with Andrew Chamberlain.) “Looking Forward to Look Back: How investigations of historical burial populations can inform our interpretations of prehistoric burial practice.” In Jay, M (ed) The Invisible Dead, Oxbow Books

In Press

2016

2016

2016

2016

2015

2015

2015


2010  (Co-authored with Alison Leavitt and Steve Wick, Principal Investigators, for the National Park Service.) “UDA Effects to Cultural and Environmental Resources in the Big Bend National Park, Texas.” Department of the Interior Reports, National Park Service: Big Bend National Park, 2010.

2010  (Co-authored with Alvin Banguilan, Project Manager, for HDR e2M Inc) “Phase II Archaeological evaluation of 44CF568 Defense Supply Center Richmond, Chesterfield County VA: Project undertaken for the ACE and the DOD” On File with HDR, Inc. Atlanta Offices

2009  “Returned to the Womb; A demographic exploration of infanticide, child burial, and infant mortality in ancient Egypt” Received Distinction. On file at the University of Sheffield Archaeological Library

2006  “When Pigs Fly and Digs Lie; What ancient Egyptian art fails to say about the consumption of pigs” Received Departmental Honors as an Outstanding Archaeological Thesis of 2006. On file at the Columbia University Center for Archaeology

2005  “Golden Calves and Golden Goddesses; Exploring the cult of Aphrodite-Hathor in Graeco Roman Egypt” On file at the Canadian Mission in conjunction with the Amheida Excavations

2004  “Locked Together in Hatred; How mutual discrimination polarized and unified the African American and Irish communities in 19th century Manhattan” On file at the New York Historical Society in conjunction with the Seneca Village Project
AWARDS

- University of Manchester, PhD Scholarship, Full Tuition, 2012
- University of Sheffield, PhD Scholarship, Full Tuition, 2012 (Declined)
- University of Sheffield, Distinction: MSc Dissertation, 2009
- University of Sheffield, USA Sheffield Scholarship, 2008
- National Parks Service, Government Star Award, 2008
- Columbia University, Honors: BA Dissertation, 2006
- Columbia University, Dean’s List, 2005, 2006

LANGUAGES

- French (Spoken, Written)
- German (Basic spoken, Written)
- Spanish (Basic spoken, Written)
- Ancient Greek (Written)

RELATED SKILLS

GIS, Museum Systems, ArcPad, ArcView, ASMIS, Excel, Adobe, Photoshop, Lightroom, GIMP, CAD, SPSS, Siebel, Argus, File Maker, Cobalt, iMovie, iTunes, Fax, Typewriter, Copier, & Scanner
GPS, MobileMapper, Trimble & Orienteering
Total Station, Magnetometry, & Resistivity
Cartography, Drafting, & Epigraphy
Photography, Video, Photogrammetry & Printing
Archiving, Cataloging, & Condition Reports
Objects Conservation
Objects Handling & Curation
Forensic Osteology
Art Appraisal
Library & Online Research
Proficient with PC & Mac
Typing: 50 wpm
Flint Knapping & Traditional Technologies
First Aid, CPR, & Search and Rescue
Rock climbing, vertical ascent, equestrianism, scuba diving, wilderness survival, & outdoorsmanship