Creating Community: Ancient Maya Mortuary Practice

at Mid-Level Sites in the Belize River Valley, Belize

by

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ABSTRACT

This research focuses upon the intersection of social complexity and leadership among commoners in complex societies as expressed through mortuary ritual. I study how ideology, materialized through treatment of the deceased body, was a potential source of power among commoners in ancient Maya society and how this materialization changed through time. Mortuary data are drawn from mid-level settlements of the Belize River Valley, located in western Belize within the eastern Maya lowlands. The primary research question addresses whether mid-level leaders in the Belize River Valley targeted certain human bodies for ancestral veneration through tomb re-entry and ritual interaction with skeletal remains. The ritual-political strategy of mid-level leaders is measured using archaeothanatology, an analysis of grave taphonomy based on forensic data, to reconstruct cultural beliefs about death based on treatment of deceased bodies, radiogenic strontium isotope analysis to reconstruct residential history, and analysis of dental metrics to assess biological kinship. While preservation of osseous material was poor, results indicate that the frequency of disarticulated and secondary burials was higher in eastern structures than in other locales, although eastern structures were not the only loci of these types of deposits. Overall, it does not seem like secondary burials were regularly and purposefully created for use as ritual objects or display. Radiogenic strontium isotope data enrich this analysis by showing that eastern structures were not a burial locale exclusive to individuals who spent their childhood in the Belize Valley. Data from upper-level eastern structures also suggests that within that part of society local birth did not guarantee interment in a local manner; perhaps the social network created during one's life shaped treatment in death more than residential origin. Biological distance analyses

were inconclusive due to missing data. Comparison of mortuary practices to nearby regions shows distinct mortuary patterning across space and time. This is consistent with reconstructions of ancient Maya sociopolitical organization as regionally diverse and moderately integrated.

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CHAPTER 1

INTRODUCTION

Of the numerous complex societies that inhabited the Americas prior to contact with Europeans, the ancient Maya left a rich historical and artifactual record in their stone monuments, colorful murals, and elaborate architecture. The aesthetic and craftsmanship of the ancient Maya is compelling to Western scholars and the general public, conveys, however, an incomplete perspective written by and about the Maya elite. My overarching goal in this dissertation is to step beyond this bias and to more fully represent the depth and complexity of ancient Maya society, thus highlighting the participation and agency of non-elite members. I seek a more balanced and representative analysis that includes all social groups, of all ages and both genders.

With this goal in mind, I focus upon the intersection of social complexity and leadership among commoners in complex societies as expressed through mortuary ritual. I study how ideology, materialized through treatment of the deceased body, was a potential source of power among commoners in ancient Maya society. I focus on mortuary data from the Belize River Valley, located in the eastern Maya lowlands. This location is ideal of a study of this type because many excavations have focused on both site centers as well as the hinterland settlements. I ask whether non-elite leaders in the Belize River Valley, located in western Belize, targeted certain human bodies, such as locally born, elder male lineage members, for ancestral veneration through tomb re-entry and ritual interaction with skeletal remains. The ritual-political strategy of mid-level leaders is measured using archaeothanatology, an analysis of grave taphonomy based on forensic data, to reconstruct cultural beliefs about death based on treatment of deceased bodies, analysis of dental metrics

to assess biological kinship, and radiogenic strontium isotope analysis to reconstruct residential history. The study is unique in that it applies multiple lines of bioarchaeological evidence to a broad anthropological subject. The work also synthesizes a large amount of extant bioarchaeological data collected from numerous archaeological projects in the Belize River Valley. These data will be made available to other researchers and will be a valuable resource.

Figure 1. Map of the Maya Region with ancient sites marked.

The ancient Maya occupied the landscape of modern day Central America, stretching from southern Mexico, the Yucatán peninsula, Guatemala, Belize, and the western parts of Honduras and El Salvador (Figure 1). The Maya culture reached its apogee in the Classic period (A.D. 200 – 900) before the elite sociopolitical system failed and brought about major demographic shifts and social transformation in the Terminal Classic (A.D. 800 – 1000). Postclassic population centers transitioned to the Yucatán peninsula and the cities of the Maya heartland were overtaken by forest.

Re-discovery of these cities occurred in the late nineteenth century and research into ancient Maya sociopolitical history, social organization, and lifeways continues to the present day. Pyramids, looming tall in the dense jungle, first caught the attention of archaeologists and were shown to contain the remains of deceased Maya rulers. Excavations further afield in the houses of non-royals revealed that the ancient Maya did not use cemeteries but interred the deceased within the stone and plaster platforms upon which their wood and thatch homes stood. Human remains were in fact found in a variety of architectural locations and body treatment took many forms. Excavators routinely encountered isolated human skeletal elements, particularly skulls, disrupted grave contexts, and graves containing multiple individuals, at all levels of the social hierarchy. A portrait of a complex and seemingly disorderly mortuary program emerged.

The research of the Tikál project, with data from royal tombs as well as hinterland settlements, presented an explanation of Maya mortuary practices as related to ancestor veneration (Haviland 1988). Marshall Becker (1971) recognized the pattern of placing interments within eastern structures as a consistent mortuary practice. He also recognized

the blurry, and possibly non-existent, distinction between the interment of a human skeleton and other offerings and caches containing human remains (Becker 1988, 1992).

The work of Patricia McAnany (2013[1995]) synthesized Maya economics, worldview, and mortuary practices. She proposed that the gathering of the deceased in houses was a form of ancestor veneration, a practice that represented a lineage on the landscape and granted continued access to agricultural land and other resources. McAnany also argued that the practice of gathering ancestors in eastern structures as a physical indication of lineage presence and sustainability in fact began with non-royal, non-elite Maya and was co-opted by rulers in the Preclassic period to legitimize their right to rule.

The non-royal, non-elite Maya continued to maintain ancestral shrines, however, well into the Terminal Classic period. If the elites drew legitimacy and power from this practice, did the non-elite do so as well? What did it mean for them to maintain lineage shrines, which they did in some locations for up to 1800 years (Robin ed. 2012)? I argue that there is still much to learn about ancient Maya social organization, worldview, power and how they are intertwined. One way to do so is by assessing mortuary practices of a broad range of social groups at the regional level. The Belize River Valley, located in western Belize, is an excellent location for such a study. The agriculturally rich river valley has been continuously occupied for at least 2000 years, and was likely inhabited much earlier (Awe 1992; Demarest 2004; Lohse et al. 2006; Lohse 2010). In the Classic period (A.D. 250 – 600) small farming communities and medium sized administrative centers populated the Belize Valley (Leventhal and Ashmore 2004:169). Consistent archaeological research in the valley produced a large sample of skeletons from a variety

of contexts and social groups. Particularly well represented in this sample are non-elite mid-level siteswhose role in the sociopolitical dynamics of the Belize Valley is is not well understood. These sites and their mortuary features, which suggest that mid-level leaders drew on the perceived sociopolitical power of ancestors for political legitimization, are the primary subjects of this dissertation.

The literature on Maya worldview from Spanish contact to contemporary times is a rich source that is not always used to its full potential by bioarchaeologists. In Chapter 2, I introduce and discuss the ethnographic and ethnohistoric literature on contemporary Maya worldview. The chapter begins by addressing the relevance of using ethnographic and ethnohistoric data to interpret archaeological data before moving on to describe several key elements in Maya worldview. Chief among these is an emphasis on observing cycles of change in the natural world, clearly depicted in the ethnohistoric document of Maya mythology, the *Popol Vuh*. The story links the sprouting, fruiting, and dying of corn plants as analogous to the human life cycle. Elements of this link between corn and human life is observed today among the Quiche Maya, who live in the highlands of modern day Guatemala. They recognize that humans must continue to actively participate in these cycles for the cycles to continue. Details are then related concerning Mesoamerican concepts of what Westerners call the “soul”. Culturally specific concepts of what constitutes life are necessary as these views effect how humans are treated at death. I rely on concepts of the life-essences from throughout Mesoamerica and the Maya region (Houston and Stuart 1996; Houston et al. 2006; Houston and Inomata 2011; Monaghan 1998; Eberle 2005; Fischer 1999; Watanabe 1992; Vogt 1969; Guiteras Holmes 1964; Lopez Austin 1988; Redfield and Villa-Rojas 1969; Astor-Aguilera 2011).

Finally, I address ideas about death among the contemporary Maya, as beliefs about death and what happens to the life-essences after death affects how the deceased body is treated (Hertz 1960[1907]); van Gennep 1960[1909]; Hodder 1982a, 1982b); Carr 1995)

In Chapter 3, I link the ethnographic data on worldview to modern social theory. For this dissertation I draw on the work of practice theorists who link individual action with overarching social structure (Bourdieu 1977, 1990; Giddens 1979, 1984; Ortner 1984, 2006; Sahlins 1981,1985; Sewell 1992). This body of work sees the two as recursively linked; individual action forms and shapes society and society, in turn, shapes individual action. I outline the details of practice theory and define its key terms, such as agent, agency, structure, rules, and resources. These terms are described and then I weave into the discussion of practice theory aspects of Maya worldview to emphasize its relevance.

I move on to a discussion of the concepts of ancient Maya religion and ritual. Mortuary practices are conceived of as part of a religious or ritual practice for many cultures. I draw on recent ethnographic work among the contemporary Maya to argue that the ancient Maya, and their contemporary descendants, did not practice a religion in the way that we define it in the Western world. There was no dogma associated with their treatment of the deceased. Furthermore, there was no notion of a distinct separation between the sacred and the profane, the natural and the supernatural. Rather, there existed different realms of physical experience, some of which living humans could not access. Death frees the life-essences of the corporeal body. However, the life essences must continue to communicate with corporeal humans to maintain balance in the universe through material objects. Their new immaterial being can influence weather and illness,

bringing good or ill luck depending on the gifts and care of the living. It is important to note that it is likely that the deceased did not maintain individual personality traits they held in life. Communication between living and non-human beings is materialized through objects and thus visible archaeologically. Leaders once powerful in life are thought to have been the focus of this communication and are conceived of as revered ancestors. It is often thought that ancient Maya elite had sole access to the cultural knowledge to communicate in this way. The chapter concludes with a discussion of ideology and access to knowledge by members of society other than the highest elite. It introduces and describes the subjects of the dissertation, the leaders of mid-level sites.

Chapter 4 presents a model of ancient Maya sociopolitical organization. This model is based on those of Demarest (1992; Tambiah 1977) and Southall (1957, 1988; Houston 1993). Scholars of the ancient Maya have yet to agree on the mechanics and manifestation of sociopolitical organization in the Classic period Maya lowlands. In fact, the variability apparent in settlement patterns and elite expressions of power suggest that sociopolitical organization may have varied not only across time but across space as well (Chase and Chase 1996b; Laporte and Mejía 2005). However, the model presented here accounts for ideology and worldview as two important factors in sociopolitical power that were materialized through ancestor veneration rituals (McAnany 2013[1995]). Chapter 4 concludes by presenting the subjects of the dissertation research, mid-level centers.

Chapter 5 builds on the ethnographic and archaeological context described in Chapters 2-4 and introduces the research hypotheses and design. The dissertation is structured around four research expectations. Expectation 1 states that individuals who were born and raised locally were typically chosen for interment in eastern structures for

veneration as ancestors. The expectation is examined further using ethnographic and archaeological data on settlement patterns and models of community organization. In the contact period the Spanish relate how mobile the Maya were on the landscape, an observation that is supported by ethnographic data on the creation of new towns and villages as offshoots of older ones. Migrants have also been identified archaeologically through radiogenic strontium isotope data. This expectation is tested using radiogenic strontium data.

Expectation 2 states that mid-level leaders entered into relationships with their ancestors, through interaction with skeletal remains. Data on the ancient Maya mortuary record are recounted with particular emphasis on the epigraphic and iconographic data that depict Maya royalty re-entering tombs and performing rituals there. Data from non-elite contexts are marshaled to argue that this practice was carried out by all parts of Maya society, not just the elites (McAnany 2013[1995]).

Expectation 3 states that individuals interred in eastern shrines were lineage members. An enduring debate within ancient Maya archaeology concerns the factors that governed group membership. Relatedness is also assumed to have affected an individual's location of burial. Societies that maintain ancestral shrines, as it is argued the ancient Maya did, are thought to have based their social organization in biological relatedness. Biological kinship is often assumed to have bound communities together, but ongoing research on social ties suggests that non-biological connections, including fictive kin and extended families, worked alongside biological kinship to integrate communities. This study proposes to test this assumption using dental metric data, which is genetically

based. It is expected that individuals interred in ancestral locations, the eastern structures of architectural groups were of the same lineage.

The fourth, and final, expectation is that the frequency and intensity of ancestor veneration practices will increase in times of social transformation when it becomes necessary to confirm and display group identity. Previous research at mid-level sites in the Belize Valley have proposed that changes in mortuary practices are seen at times when a site gained autonomy from a higher power (Iannone 1996; Schwake 2008). This expectation is tested here at multiple sites in the Belize Valley. Mortuary data such as the frequency and location of secondary burials as well as an increase in non-intrusive interments are the data used to address this expectation.

Chapter 6 introduces the history of the ancient Maya in the Belize Valley from the Middle Preclassic to the present day. It also recounts the history of archaeological research in the Valley and describes both the sites from which burial data were drawn for the study, as well as the sample selection strategy. To address the role of mortuary practices in defining social organization, the sites in the Belize Valley were divided into upper-level, mid-level, and lower-level site types based on architectural elaboration. The focus of this dissertation is the mid-level sitesand their place in ancient Maya society as shown through mortuary practices. To this end they are compared and contrasted with sites along the spectrum of social organization in the Belize Valley.

Chapter 7 delves deeper into the bioarchaeological methods used to address the research hypotheses laid out in Chapter 5. The history of research is given for each method to contextualize and justify its use. The chapter begins with mortuary analysis in archaeology and the contributions of the sociologists Robert Hertz and Arnold Van

Gennep. I move on to cover the contributions of processual and post-processual approaches to the study of ancient mortuary practices. I conclude this section by reviewing the method of *anthropologie de terrain*, or archaeothanatology, the study of death based on the taphonomy of human remains. Originally developed by French archaeologists, archaethanatology is not used much in North America, although it is gaining proponents in the field of ancient Maya bioarchaeology. I argue that the complexity of the Maya mortuary record is best studied when augmented with this approach and provide a summary of current research in Maya mortuary studies.

I devote the third section to biogeochemical methods used to assess residential history for the ancient Maya. The geology of radiogenic and stable strontium isotopes is discussed first, followed by a description of how bioavailable strontium makes its way into living human bone through consumption of food and ground water. I address, next, aspects of the archaeological environment that alter bones and teeth and may compromise analyses, as well as how these contaminants are dealt with. The section concludes with a summary of current research in the Maya region using radiogenic strontium isotopes.

The background for biodistance analyses is described in the next section. In the past century, physical anthropology has moved from a descriptive discipline with few analytical tools to one that quantifies human variation and how it has changed over time according to evolutionary processes. The human dentition is an excellent basis for studying biological relationships between individuals and groups because their size and morphology are linked to the genotype, although environment does play a significant role in their phenotypic expression. Dental data are especially useful to this end in Mesoamerica because preservation of the dentition is generally good even if there is little

osseous material preserved. The section concludes with a description of the current research that is relevant to understanding the results presented in Chapter 8.

Chapter 8 describes in detail the materials and methods used in the study. I present sections according to expectation and method. Details concerning the sampling design for biogeochemical analyses are outlined in the first section. The lab procedures are also detailed as well as the baseline study recently completed by Carolyn Freiwald (2011), which set the foundation for radiogenic strontium analyses in the Belize River Valley. The subsequent section reports the sample of skeletons and burial contexts used for the mortuary analysis. The variables used in the analysis are described, as well as the demographic composition of the sample. Finally, the biodistance data collection and analysis are described. There are number of pre-analysis treatments necessary for accurate biodistance analyses, including those relating to age-at-death, sex, trait intercorrelation, and the management of missing data. These procedures as well as the statistical tests used in the analysis are presented here.

Chapter 9 reports the results of the biogeochemistry, mortuary, and biodistance analyses. This dissertation contributes to a growing body of biogeochemistry data from the Belize Valley. Baseline data and over 100 ancient human samples were analyzed by Dr. Carolyn Freiwald as part of her doctoral dissertation (Freiwald 2011). New data from two sites, Chan and Cahal Pech, are presented here. Elemental concentration data, a methodology still in its earliest stages for estimating residential history, are also presented. Mortuary data from 27 sites and 573 individuals are reported and confirm that the overarching burial program at all sites in the Belize Valley was to inter a single individual in a prone, extended position with head to the south. Each data set presented

here aptly demonstrates that variation is the norm when ancient Maya sites are compared. The biodistance results are presented last, and can only be interpreted with caution, as sample sizes were small and the dental measurements generally homogenous.

Chapter 10 discusses the results presented in Chapter 9. Results suggest that mid-level sites, in the language of practice theory, had access to material and immaterial resources (i.e. knowledge) used in the conduct of mortuary ritual. I am able to characterize mid-level sites as nodes of communities that anchored the surrounding settlement. Lower-level sites also follow the overarching mortuary schema of the Valley, with small variations with respect to head orientation. Upper-level sites show a higher degree of variation in terms of body position and orientation, possibly suggesting a broader interaction network. Overall, mid-level sitesappear to be nodes of community building in the Belize Valley.

Chapter 11 concludes with an assessment of the potential to enhance mortuary studies through focusing on detailed taphonomic data collection in the field by a bioarchaeologist. The Belize Valley continues to be focus of archaeological research in the Maya area, and these projects contribute to an already extensive and unique collection of ancient Maya skeletal remains. Poor preservation, made worse once material is removed from the ground, requires focus on data collection by trained bioarchaeologists in the field. The rich mortuary traditions of the ancient Maya still have much to convey about their unique worldview and social organization.

CHAPTER 2

MAYA WORLDVIEW

For the ancient Maya, funerary rituals were as much a celebration of life as they were a commemoration of death. The root of ancient Maya sociopolitical power was the lineage, a kin-based social organization associated with access to agricultural land (2000a, 2001, 2002; McAnany 2013[1995]; McAnany et al. 1999). Lineage based rights to land were dramatically reinforced by interment of deceased lineage members within residential ancestor shrines and periodic rituals of veneration (Becker 1971; Gillespie 2002; Leventhal 1983; McAnany 2013[1995], 1998). Archaeological, ethnographic and ethnohistoric data indicate that post-interment manipulation of human skeletal remains by smoking and exhumation of certain elements were, and still are, a crucial component of veneration rituals (Aguilera 2004, n.d.; McAnany 2013[1995]). Archaeological data shows that these practices have considerable time depth in the Maya area and that they were appropriated and dramatized by an emerging elite society to legitimize their political power during the Late Preclassic period (300 B.C. – A.D. 100/150) (Freidel 1992; Freidel and Schele 1988; McAnany 2013[1995]; Reese-Taylor and Walker 2002; Robin and Hammond 1991). While the elites enacted the apotheoses of their ancestors in grand public rituals the non-elite continued to venerate their dead through burial location, grave goods, and post-interment rites as well (McAnany 2013[1995]; Robin and Hammond 1991). This chapter reviews the data and interpretation of ancient Maya worldview to orient the reader.

Maya Worldview: Linking Ancient and Modern

Intergenerational regeneration and renewal is the most fundamental, guiding principle of Maya worldview. Today, the Maya recognize it everywhere in daily existence – in agricultural cycles of planting and harvesting, in the birth of children and death of grandparents, and in the rising and setting of the sun and stars. In the following section, I detail Maya worldview to provide a broad understanding of the ideas they drew upon in materializing their beliefs.

Reconstruction of Maya worldview is a multi-disciplinary endeavor that relies upon the findings of ethnohistorians, ethnographers, archaeologists, and epigraphers. The foundation of these studies is manuscripts composed by the Spanish monks and priests whose goal was to convert the Maya to Catholicism (de las Casas 1992; Restall 2003; Tozzer 1941). Friar Diego de Landa, a Franciscan monk, compiled his *Relacion de las Cosas de Yucatán* in the late 1500's from his own observations and those of Yucatec Maya informants. Landa's account is considered the best representation of the contact-era Maya, particularly pertaining to details of Maya religion and ritual (Restall and Chuchiak 2002; Tozzer 1941:vii).

Maya Cosmology

Here, worldview refers to how the Maya perceived themselves in relation to the universe, the geographical landscape of their world (see Astor-Aguilera 2010:23). Reconstruction of ancient and modern Maya worldview relies in part on the *Popol Vuh*, a contact-era text that tells the history of the Quiche Maya people, whose modern

descendants reside in the Western highlands of present day Guatemala (Tedlock 1996:25-26). According to the *Popol Vuh*, gods of the sea and sky created the physical world at a time when only the sea and sky existed (Tedlock 1996:30). Various scholars describe the Maya universe as having three planes of existence – the Upper, Middle, and Underworlds (Demarest 2004:179; Freidel, et al. 1991; Freidel et al. 1993; Schele and Freidel 1990:66; Sharer and Traxler 2006:730; Tedlock 1996:34; Vogt 1969:298). Sharer and Traxler describe thirteen planes within the Upperworld, and nine additional planes of the Underworld, each with its own "god" (Sharer and Traxler 2006:730; see also Demarest 2004:179). The Middle world is the earthly realm that sits atop the waters of the primordial sea of the Underworld (Tedlock 1996:30). The surface of the earth is divided into four quadrants according to each cardinal direction with certain colors, gods, animals, and rituals representing each direction (Coggins 1988:74; Freidel, et al. 1993:129; Knab 2004; Schele and Miller 1986:42). The center of the world was marked by the world tree, or *wacah chan*, which was established at certain locations through ritual activity to recreate a spatial order and focus spiritual forces (Freidel, et al. 1993:131; Freidel 1992:120). The *wacah chan* was rooted in the Underworld and stretched through the plane of human existence into the Upperworld where the deceased could reside in its comfortable, cool shade (Demarest 2004:180-181; Freidel, et al. 1993:128; Guiteras-Holmes 1961:144; Redfield and Villa-Rojas 1962:199; Schele and Freidel 1990:67; Tozzer 1941:132). Friar Diego de Landa, drawing on conversations with Colonial-era Maya people, describes Maya perceptions of the Underworld, called *metnal*, as a watery, dark place where souls of the dead were tortured with demons, weariness, and hunger (Tozzer 1941:132). The concept of *metnal* is close to that of the

Western “hell” suggesting Christian influence in this description (Sharer and Traxler 2006:733).

Change and the Material World in Maya Worldview

The *Popol Vuh* narrative establishes the importance of creation through generational change and illustrates the relationship between the natural environment and human life (Tedlock 1996:42, 44). Key to this narrative is the cycle of death and rebirth acted out by the hero twins and their offspring traveling between the Middle and Underworlds avoiding capture and death at the hands of the Lords of the Underworld (Tedlock 1996). The first set of hero twins are sacrificed by the Lords of the Underworld and after death one impregnates a young woman who bears the next generation of hero twins (Tedlock 1996:36). The second generation of hero twins trick the Lords into thinking they are dead but they are reborn after the Lords grind their bones and throw them in a river (Tedlock 1996:42). This is paralleled by the creation of humans by the grandmother of the hero twins, who grinds corn and mixes it with water to form men and women (Tedlock 1996:43). In a further parallel between human life and the natural world, the grandmother plants corn when her grandsons travel to the underworld and can observe their death and rebirth through the seasonal dying and replanting of the corn plants (Tedlock 1996:43).

It is important to note that the *Popol Vuh* narrative describes the events that occur in the Underworld and on earth in tandem and that these events parallel the movement through the sky of the sun, moon, and Venus (Tedlock 1996: 34, 42). Furthermore, the hero twins are able to move physically from one to the other with ease. They move

between realms by solving riddles and enduring various trials (Tedlock 1996). This indicates the permeability and not-separateness of the realm of the Underworld and the earth. The imagery of the natural, physical world used in the *Popol Vuh*, the importance of vegetation (corn, calabash trees), the seasonal change, and human reproduction, also speak to the interrelatedness of these realms and the relationship between human beings and the environment. The relationship between the natural world and Maya worldview is further illustrated in the concept of *jaloj-k'exoj,* (Flowering Mountain Earth) (Carlsen and Prechtel 1991:27). Flowering Mountain Earth is " . . . a unifying concept, inextricably linking vegetation, the human life cycle, kinship, modes of production, religious and political hierarchy, conceptions of time and even of celestial movement" (Carlsen and Prechtel 1991:27). This definition suggests that *j'aloj-k'exoj* is a broadly defined worldview that connects all aspects of society.

The words themselves are two different ways of describing change. The first, *j'al,* refers to external change of the individual and is analogous to changes observed in the husk, or outer layer, of a corncob (Carlsen and Prechtel 1991:26). This is the type of change observed in human life cycles – birth, old age, and death. Because they are planted in the earth just as human remains are buried upon death, maize seeds are called *muk* (interred ones or little skulls) (Carlsen and Prechtel 1991:28). Young maize plants are called "little ones" when they are small sprouts and, ultimately, they grow, bear fruit, and die. *K'ex* connotes long term change, i.e. change over generations (Carlsen and Prechtel 1991:28). The cycle of life, death, and regeneration begins again with the planting of kernels, seeds, of dead maize plants. In this process life has sprung from death and there has occurred a recycling of the ancestral form. If *j'al* is the husk of the

corncob, *k'ex* is the "seed" that represents rebirth and regeneration through time. Used together these terms " . . . form a concentric system of change within change, a single system of transformation and renewal" (Carlsen and Prechtel 1991:26). The life cycle of the maize plant, as discussed above in the myth of the hero twins, is analogous to that of humans – the spirit of the deceased is regenerated in their descendants (Carlsen and Prechtel 1991:28). This concentualization seems different than reincarnation, however, in that the life-essence material is not individual. Paralleled by the cycles of maize are, " . . . the cycles of life, of the sun and moon, of living time" (Carlsen and Prechtel 1991:32). The principle of concentric death and rebirth is further elaborated, below, in a discussion of animating essences. Thus, correct Maya behavior maintains these generational cycles by participating in agricultural renewal, bearing children to propagate the lineage, and engaging in reciprocal relationships with all persons – living and deceased.

Mesoamerican Life Essences

Maya worldview linked changes in the physical world with agricultural cycles, human reproduction, and the movement of time. Links between ethnographic and epigraphic data suggest that there existed an energy, a vital essence, that pervaded the universe and it was from this vitality that humans drew life (Astor-Aguilera 2009:10; Fischer 1999:480; Furst 1995:176, 182; Guiteras-Holmes 1961:289, 306; Houston and Inomata 2009:196; Monaghan 1998:140; Sharer and Traxler 2006 2006:730). Houston and Inomata (2009:195) state that the term *k'uh*, when appended with particular suffixes, describes this vital essence, which is found in humans flowing through blood. For some contemporary Maya groups the term can used even more broadly to include the source of

human intelligence and emotion (Houston and Inomata (2009:196), although it is important to note that *k'uh* is also described as impersonal. As will be discussed below, a human possesses *k'uh* and the day of their birth and actions in life shape their individuality as a person.

A key trait of *k'uh*, as a vital or life essence, is that it is constantly in flux. It emergizes, animates, and invigorates the material world but it can become detached and dissipate, shift, and reattach to other material objects (Houston and Inomata 2009:196-197). Through appropriate action, such as actions associated with ancestor veneration described below, the living could influence and affect the constant fluctuations of the *k'uh* in the world. The glyph *k'uh* appears in ancient Maya inscriptions and monuments with kings and queens. One aspect of their power seems to have been a large quantity of this vital essence (Houston and Inomata 2009:197).

One principle of the Maya life essence, a concept that is consistent throughout much of Mesoamerica, is that the vitality has multiple aspects. The Tzotzil Maya of Chiapas, Mexico, believe in two aspects – the *ch'ulel* and the *wayhel* (Guiteras-Holmes 1961:296; Vogt 1969:369). The *ch'ulel*, called the *pixan* or *tonalli* by other Mesoamerican groups, is immortal and indestructible, even by death (Astor-Aguilera 2010; Fischer 1999, 2001; Fischer and Hendrickson 2003; Monaghan 1998). It always exists and is passed from being to being in a cycle, described above, and is associated with blood, the heart, and the head (Furst 1995:176-177; Guiteras-Holmes 1961:297; Vogt 1969:369). Barbara Tedlock and Evon Vogt report that the blood can be used as a means of communication with the vital essences of the deceased (B. Tedlock 1982:138; Vogt 1969:369). The *ch'ulel* can become detached from the body in certain

circumstances, during sexual intercourse, drunkenness, and dreaming, and it can be stolen through obtaining a strand of hair or piece of fingernail (Furst 1995:177; Guiteras-Holmes 1961:303; Knab 2004:31;Vogt 1969:369). In the living, the life essence is restored through performance of rituals appropriate to the circumstances in which the essence became detached (Fischer and Hendrickson 2003:82; Knab 2004:33; Vogt 1969:370).

The *wayhel*, a second aspect of the life essence, is describe for the Tzotzil as an animal-like that shares qualities and experiences with the human to whom it is attached (Guiteras-Holmes 1961:298). Communication with the deceased ancestors occurs through the *wayhel*, according to the Tzotzil (Guiteras-Holmes 1961:298). Evon Vogt (1969:371-372) adds that the *wayhel*, also called *chanul*, has thirteen parts and is transmitted from the ancestors to their descendants and cared for by the ancestors during the life of the descendant. John Monaghan (1998:143) describes the sharing of a coessence, akin to the *wayhel*, as a joining of two beings that came into the world at the same moment in time. These beings can, and often are, physically discrete – like an animal and a human – but share a coessense, the *wayhel*. One's coessence can cause things to happen that would otherwise be attributed to a physically present human, " . . . it may choose to raid a milpa and be shot and killed in the process, dooming its human counterpart as well" (Monaghan 1998:143). Monaghan (1998) does not recognize an explicitly ancestral aspect to the 'coessence' and the details of this aspect of the life essence remain to be explored completely (Furst 1995:184).

A third soul is identified in Aztec traditions and is variably recognized elsewhere in Mesoamerica (Furst 1995; Knab 2004; Lopez-Austin 1980). The third aspect of the

life essence, or *ihiyotl*, is difficult to describe. The *ihiyotl* is associated with negative aspects of a person's choices in life (Furst 1995:179; Knab 2004:28). It is associated with flatulence and foul smelling gases that emanate from a decaying corpse (Furst 1995:179; Knab 2004:28; Lopez-Austin 1980). An ancient Maya hieroglyph *u tis* meaning "his flatulence" is associated with the concept of the *ihiyotl*. It is associated with strong, foul odors. The contemporary Ch'orti' Maya associated strong smells with living people who are envious, angry, or exhausted (Lopez Austin 1988). As the first aspect, the *k'uh/tonali/ch'ulel*, is linked to the heart and the blood, the second to animals of the forest, Furst (1995:179) links the soul with observable natural phenomena of death.

As mentioned above, the life essence gives vitality and heat but it is malleable and detachable. John Monaghan (1998) draws on Mesoamerican concepts of the soul to characterize Maya personhood. He suggests that Maya personhood is defined by the possession of a destiny that is acquired on the day of one's birth (Monaghan 1998:138). Each day in the 20-day month of the 260-day calendar is named and has corresponding attributes or characteristics that are conveyed to people born on that day (Monaghan 1998:138). Monaghan (1998:137) argues that the Spanish were believers in astrology and, since this concept of destiny was based on calendrical readings for each day of the calendar, the Spanish translated the concept as luck, the will of god, fate, all implying an exterior force that is beyond the individuals power to control. Monaghan explains that the term for destiny, *pixan*, *vach*, *tonalli*, or *hado* in Maya and Nahuatl dialects, was eventually translated, after experience with Christianity, as "soul" by the Maya because to them it connotes internal aspects of ones destiny or identity. The complexity of the Mesoamerican *ch'ulel, pixan, or tonal* is lost in Western translation (Aguilera personal

communication, Fischer 1999; Monaghan 1998). Monaghan (1998) suggests the best translation of the term, *vach*, also means face in Kaqchikel Maya, " . . . conveying as it does that destiny, in both its conception and experience, is at the same time part of the body *and* subject to an outside power – the internal and external complexly intersecting" (Monaghan 1998:139; see also Houston and Stuartt 1998, Houston and Inomata 2009). Furst (1995:182) explains that the Mesoamerican soul, " . . . form[s] a continuum from internal to external phenomena". In Classic Maya monuments and iconography, the life essence, translated as *k'uh*, is materialized as droplets associated with glyphs for the color red meant to indicate the oozing of blood and vitality from royal bodies during bloodletting ceremonies (Houston and Inomata 2009:197).

Interestingly, one born on the last five days of the Mayan calendar is devoid of personhood (Monaghan 1998:140). It was an extremely inauspicious time to come into the world because the individual " . . . lacked a destiny [and are] antisocial, amoral and, in conformity with the notion that destiny is corporeal as well as being an outside force, even seemed to lack a defined physical form . . ." (Monaghan 1998:141, brackets added). This suggests to Monaghan (1998:141) that one can be born and live a physically healthy life but without the 'character' bestowed on people born within normal calendrical 'time' one will be lacking in social relations and physical form in a community sense. He concludes that personhood in Maya thought should be considered relational, it should be considered as placing an individual within a collective whole and defining them as a person based on their connections to other persons (Monaghan 1998:140-141).

Monaghan's idea of destiny is not 'fate' or 'the will of god' because people mold their destiny through their actions over the course of their lives (Fischer 1999, 2001;

Monaghan 1998:139; Gillespie 2001). His discussion of what it means to be a person emphasizes that social relations within a collectivity are essential to being a person in Maya society and that becoming part of that collectivity means being placed in time (Monaghan 1998:142). Fischer and Hendrickson (2003:85) explain that, among the Kaqchikel, the modern *k'u'x* ("heart", "vital-essence", "soul") is weak at birth which allows it to be shaped over the course of life so that, " . . . souls are born of lived experience. They are emergent, constantly built out of daily experience and practical activities" (see also Fischer 1999:486; Nash 1970). John Watanabe (1992:90) recounts that, for the Maya of Chimaltenango, having a "soul", called *naab'l* in Mam, is " . . . culturally self-evident and behaviorally self-referential". That is, the existence of the *naab'l* is defined by the action of individuals through their actions in life. Having *naab'l* and maintaining it is thus behaving in an acceptable Chimalteco manner, " . . . the moral logic of Chimalteco souls demands an existential eloquence of continual engagement with other individuals, predicated on established cultural precedents" (Watanabe 1992:91). Among the Tzotzil participating in bad behavior angers the ancestral spirits and thus risks soul-loss. The threat of a person's life essence becoming detached remains a potent form of social control (Vogt 1969:373). This perspective departs slightly from Monaghan's calendrical basis for an orientation of personality traits but emphasizes the aspect of Maya personhood that is actively shaped through socially correct participation in ones community. It is possible that power relations between elites and non-elties among the Classic Maya were underscored by an emphasis on correct social behavior. Based on hieroglyphic data, it seems that the royal persons were seen as possessing more

of the vital, “hot”, life essence than non-royals, and they likely could manipulate its ebb and flow in ways that non-royals and non-elites could not.

Self and Body in the Classic period

The ethnographic and ethnohistoric data on Maya concepts of life essences and personhood are rich (Houston and Stuart 1998; Houston et al. 2006). The Maya, however, were not timeless and concepts such as those surrounding the existence of life essences cannot be applied without caution to the ancient Maya. Ongoing translations of hieroglyphic inscriptions and interpretations of iconographic reprsentations of carved monuments and murals provide some insight into ancient Maya concepts of personhood and self.

Houston and colleagues (2006:68-70) present hieroglyphic and iconographic data to support their argument that the head and the face were, “the essential manifestation of the body”. The word *baah* is analogous to “body” and in translation it is the, “object of reciprocal or reflexive action,” (Houston et al. 2006:60) meaning that it indicates the notion of “self”. *Baah* can also mean “head” or “face”, indicating the, “locus of identity . . . the receipient of reflexive action” (Houston et al. 2006:60). The reflexive nature of fthe word and its common pairing with a pronoun *u-* (his, her’s, its) translates as a body belonging to an individual. Epigraphers interpret this useage as a link between a living individual and images depicting a person (Houston et al. 2006:64). Rulers depicted on carved stone monuments often have name captions that include the *u-baah* glyph (“the ‘body’ of”). One form of the glyph is as a logograph, which is the head of a pocket gopher, and Houston and colleagues (2006:64) describe these name captions as using the

head to indicate the presence of the entire body. Mesamerican languages commonly, "take a small part of the person and makes it stand for the whole" (Houston et al. 2006:64). Houston and colleagues explain that crafting and carving an image of a person results in a piece of the vital essence of that individual becoming part of that image (Houston et al. 2006:76). This is particularly apropos for the stela and carved monuments depicting rulers. If the essence of the ruler was within the stone then the ruler could be ever-present, both in life and after death (Houston et al. 2006:78).

Further emphasizing the importance of the head as standing in for the entire body, a lord's name would appear in his headdress in murals and on sculpture (Houston et al. 2006:68). Decapitated heads abound in Maya iconography; decapicated heads are shown hanging from a lord's belt, suggesting they were the heads of captives. The association of the head with life essences and the entire body suggests that the wearing of captive heads was seen as the wearer has having taken on the vitality and essence of the slain captive (Houston et al. 2006:72). The *u-baah* glyph is also used in expressions regarding parentage (Houston et al. 2006:67).

According to Classic period inscriptions and iconography, the human body was the wrapper or container of the life essences. The Tzotzil Maya term *pixan*, referring to life essences, is thought to have come from the word for a "wrapped thing" (Houston et al. 2006:34). The physical body was seen as being alive and body parts were used in hieroglyphs to indicate vitality, energy, and alive-ness (Houston et al. 2006:35). Objects Westerners may consider static and unchanging, like a cave, were considered dynamic and vital by the Maya and were show to be so by using human body parts to represent

them in art and imagery. For instance, cave entrances are linked to open mouths and stalactites with teeth (Houston et al. 2006:36).

Houston and Stuart (1998:94 note 19) found that naming practices, and possibly associated concepts of self and individuality with relation to the Maya kings, gain precision and specificity in the Late Classic period that they lacked in the Early Classic. The images are also different over time. In the Early Classic kings are depicted in ritual costume while they are much more individualized and active in the Late Classic; kings are depited playing the ballgame, negotiating with other elites, and engaging in warfare.

Possessing a physical body, which wrapped and secured the life essences, was an essential part of existence for humans. The above consideration of the Maya experience of the physical body, of the importance of the head as individual identifier, and the idea the the body is an container for the life essences that are yearn to be free and unconstrained, add a rich background to mortuary studies. While the concepts were likely not exactly the same, there seems to be precedent in the Classic period inscriptions for the idea that the self or person could "exceed the boundaries of the human body" (Houston and Stuart 1998:90). It is important to note, in conclusion, that these examples are based on the words and images of the royal elite and, while enlightening, are also one point of view. Also, the texts and images available for analysis are almost certainly objects of political propaganda that may not be representative of the broader Maya culture (Houston and Stuart 1998). In the next section, cultural concepts concerning death are discussed as well as how death affects the life essences.

Death in Maya Worldview

Physical death among the Maya is the result of the loss of the vital life-essence. Ethnographers working throughout the Maya area report that humans cease to exist because the life essences leave the body and not because the body fails to support the life-essences (Fischer and Hendrickson 2003:81; Guiteras-Holmes 1961:297; Nash 1970:xvi; Redfield Villa-Rojas 1962:199). Furst describes death involving multiple souls as, " . . . dissolv[ing] into constituent parts whose nature is to live, with or without an intact body" (1995:182, brackets added). Redfield describes death as a struggle in which the life-essences do not want to leave the body and remains with the physical body for a certain amount of time, approximately a week after death though the time varies by group (Astor-Aguilera 2004; Guiteras-Holmes 1961:298; Redfield and Villa Rojas 1962: 200; Vogt 1969:222). Nash (1970:131) reports that if the individual was killed the life-essences may linger for up to a month because it is confused and does not know where to go.

Ritual activity performed immediately before and after a death is done with the purpose of propitiating and caring for the life-essences of the deceased so that they may depart peacefully (Guiteras-Holmes 1961:140-141; Redfield and Villa-Rojas 1962:200-201; Vogt 1969:218). The life-essences does not want to leave its home and relatives and struggles to remain. Precautions such as the spitting of salt water, collection and burning of hair or nails of the deceased, and calling to the deceased, are taken so that the life-essences does not attach to family, friends, or possession within the house and follows the body to the cemetery (Guiteras-Holmes 1961:140-141; Redfield and Villa-Rojas 1962:200-201; Vogt 1969:218). Guiteras-Holmes (1961:140) reports that if the death occurred some distance from the village where the deceased resided the funeral would be

delayed to allow time for the life-essence to reunite with the body. The home of the deceased is not swept for the week or so after death so that any remnants of the life-essences can be reunited before it travels to the underworld, or afterlife (Redfield and Villa-Rojas 1962:201).

When death occurs, the life-essences exit the body through the head or tongue (Furst 1995:180; Guiteras-Holmes 1961:298; Nash 1970:131). The life-essences are not randomly released into the earth (Furst 1995:178) but, as described to anthropologists and depicted iconographically by the ancient Maya, they went to the underworld (see also Carlsen and Prechtel 1989; Redfield and Villa-Rojas 1962:199). Furst describes this concept very clearly, " . . . the human life force went to the underworld . . . [but] it was not wasted . . . the world below was also the place where the seeds of new lives were kept . . . the underworld contained not only corpses but plants, which were pushed up from below . . . Their living relatives sent them off after death . . . and then called them back annually as the life-giving rain clouds. The ancestors' animating force spread across the dry land and returned their vital power to the surface and to their relatives' fields and crops" (Furst 1995:178 brackets added). It should also be noted that not all of the life-essences had the same fate after death.

Furst's insight, though gained from the ancient Mexica, dovetails with modern Maya ethnographic data. After death, Maya life-essences are transformed into non-corporeal other-than-human beings that behave in human ways (Astor-Aguilera 2004, 2009:173; Gann and Thompson 1931:249; Knab 2004). Other-than-human beings have volition and are capable of rational action (Astor-Aguilera personal communication 2007; Monaghan 1998:143). They want to eat, drink, dance, and communicate with the living

and become contemptuous and troublesome if they are not cared for (Astor-Aguilera 2009:173). Thus, the deceased are continually cared for by living descendants through offerings of food, drink, flowers, and copal incense bestowed at certain times throughout the year, and when their assistance is required by their descendants (Astor-Aguilera 2004:177, 2009:173-174; Freidel et al. 1993; Guiteras-Holmes 1961:144-145; Nash 1970:135-136; Redfield and Villa-Rojas 1962: 202-203; Vogt 1969:222-223). Astor-Aguilera describes this continued relationship as reciprocal, " . . . certainly my consultants do not want their dead to bother them but on the other hand they do want their dead to help with the cornfield and other pragmatic household matters, such as finances, and health" (2004:177; see also Freidel et al. 1993). If the ancestors are propitiated and cared for during burial and after death they can be called upon to assist the living. Not all of the deceased are called upon as ancestors and the life-essences of those who are not remain in the Otherworld as other-than-human beings. The pool of vital energy is drawn upon for new human life.

Maya Living Ancestors

Cross-culturally, ancestors are deceased family members who do not automatically become ancestors at death but are created through specific posthumous rituals and who are actively involved in the lives of the living (Fortes 1976, 1987; Freedman 1966; Hertz 1960 [1907]; Fitzsimmons 2009; McAnany 2013[1995]; Shiels 1975, 1980; Scheffler et al. 1966; Tatje and Hsu 1969; Keightly 2004; Chambert-Loir and Reed 2002; Pelras 2002). How an ancestor is created is specific to a culture's

cosmology and worldview; it varies a great deal. The most influential discussion about ancient Maya ancestors is that of Patricia McAnany (2013 [1995]).

Drawing on the extensive literature on ancestors in Asia and Africa, principally Fortes (1987) and Freedman (1966, 1970), McAnany defines ancestor veneration as "rituals and practices surrounding the burial and commemoration, by name, of apical ancestors of kin groups" (McAnany 2013 [1995]:11), although she emphasizes, as do others, that "not all ancestors are remembered equally" (McAnany 2013 [1995]: xxv, 11; Fitzsimmons 2009:60). McAnany does not give a strict definition of an ancestor, implying instead that these individuals were, in life, kin group leaders and/or founders of lineages. McAnany finds lineages, discussed further in Chapter 6, to be ubiquitous in the ethnohistoric literature on Maya social organization, since the lineage anchors a social group to land and its resources (McAnany 2013 [1995]:22). Ancient Maya dwellings grouped around common patios provide a material link to a lineage based social organization (Ashmore 1988; Haviland 1988). Among the ancient Maya, interment of the group's deceased among the buildings established a "genealogy of place" demonstrating resource rights to other lineages and factions (McAnany 2013[1995]).

The term "veneration" is used here, as it is closer to what the Maya see themselves as doing during rituals associated with ancestors. Worship, as it is used in the anthropological literature on ancestors (for example Shiels 1975, 1980; Scheffler et al. 1966; Tatje and Hsu 1969; Keightly 2004; Fitzsimmons 2009), suggests an attitude of respect. However, following the observations of Astor-Aguilera (2010:68) the ancestors only gain respect when they are behaving reciprocally with the living. Maya ancestral beings behave in human ways – they have volition, are capricious and can be difficult to

please, and crave comfort and sustenance, provided by surviving family members, such as candles, food, alcohol, incense, and flowers. In return for these sustaining gifts the deceased protect and support the living (Astor-Aguilera 2009:174, 178). It follows that the ancestors, deceased, non-corporeal beings, must earn respect in the manner of a living person. They are not worshipped by virtue of being a deceased forebear; only select deceased are chosen. Veneration is defined as respect or awe that is "inspired by dignity, wisdom, or talent" (Merriam-Webster 1997). All beings must prove themselves worthy of further communication and veneration.

McAnany (2013 [1995]:11) states that for the Maya a critical characteristic of ancestor veneration, possibly part of the creation of an ancestor, is that of protracted burial rites. Grave re-entry is documented for Maya royalty, both archaeologically and epigraphically (Fitzsimmons 2009). Fitzsimmons (2009:142), synthesizing data from throughout the Maya lowlands, states that re-entry involved, first, the removal of capstones, modification of the grave goods and often the skeleton. Typically incense was burned and sometimes bones were removed, and finally the chamber was re-sealed, either temporarily or permanently. The presence of fire is emphasized epigraphically and archaeologically, with evidence for burning apparent within some tombs, and bones were painted with cinnabar. Re-entry rituals occurred at major lowlands sites throughout the Classic period (Fitzsimmons 2009:142). The practice is especially prominent at the southern Belize site of Caracol (Chase and Chase 2011). Much is known, McAnany points out, about mortuary ritual and ancestor veneration from the point of view of the elite. "Across social fields, the generalizability of royal texts and iconography that refer to ancestralizing practices is undetermined and represent an understudied topic"

(McAnany 2013 [1995]:xxiii, xxvii; see also Pelras 2002). It is likely that there were differences in the way that commoners venerated ancestors when compared to the Maya royals.

One goal of this dissertation is to clarify the non-elite mortuary practices associated with ancestors and their veneration. Since McAnany's (2013[1995]) study of Maya ancestors scholarship on ancestor veneration, heirlooms, and collective memory has increased (Fitzsimmons 2009: 16). As noted above, much of that scholarship has to do with Maya royal expressions of ancestor veneration (Fitzsimmons 2009; Eberl 2005). McAnany's (2013[1995]) argues that the placement of deceased leaders in certain types of architecture as well as returning to these locations to care for and venerate the skeletal remains was coopted by elites and used as a tool of political manipulation and legitimization starting in the Preclassic period. Other scholars have argued that non-elites did not reify individual ancestors or lineages, as ancient Maya royal families did in their iconographic representations of communication with named antecedents, but venerated a more generalized, collective idea of ancestors. As Fitzsimmons (2009:170-171; see Houston and Stuart 1996) argues, ancient Maya royalty represent a concentration of *k'uh* or "heat" which makes them subject to different mortuary treatment. Furthermore, their death necessitated a reorganization of the social order to ensure continuity of power. The ancestors were called upon to support and assist in the transition between rulers by legitimizing the new ruler, as the deceased ruler transitioned into an ancestor (Fitzsimmons 2009:181). It is not clear how much of the attitudes towards death and associated body treatment were consistently held throughout all parts of Maya society. Commoners did not use hieroglyphic inscriptions and art to depict their ancestors but

may have done so by other means. They clearly established mortuary locations that were reused over millennia suggests that establishing a place for the ancestors was important for them, too. One goal of this dissertation is to explore non-elite beliefs about ancestors and materialization of these beliefs in more detail, as well as to address how these beliefs may have changed over time.

Conclusion

Maya thought and action revolve around maintaining a balance in the universe, a cosmic order in which they exist in relation to all other beings (Fischer 1999:480; Knab 2004:9, 20-21, 38; Monaghan 1998). The reciprocal relationship between the dead and surviving members of a community follows from this core belief. The living have a duty to care for the essence of the deceased and maintain a connection with it so that it will be peaceful in the underworld and inclined to, in turn, assist the living. Maya worldview is characterized by an integration of the natural with the supernatural and is shaped by observations of the natural world, the cycle of the seasons, the physical reality of biological death (Furst 1995). The following chapter will integrate the details of Maya worldview and ancestor veneration described here with modern social theory.

CHAPTER 3

THEORETICAL PERSPECTIVE

Drawing on ethnohistoric and contemporary ethnographic data, the preceding chapter reviewed Maya worldview. The present chapter steps back from Maya culture and focuses first upon social theories that provide a framework for understanding how societies function. These theories will then be integrated with Maya concepts of social life and worldview to show that they provide additional insight into the relationship between social institutions, like ancestor veneration, and individuals within society. I begin by describing practice theory, a particular way of conceiving of social processes that emphasizes the effect of human agency on broader social structures, and, in turn, the constraining or enabling effects of structures on human agency. Subsequently, the anthropology of religion is discussed, as mortuary practices, the subject of this dissertation, are often conceived of as religious in nature. However, it is argued that the contemporary Maya, and likely the ancient Maya as well, did not conceive of themselves as practicing a religion, but rather ritual practice was incorporated in the everyday activities at all levels of society. The chapter concludes by discussing Maya ancestor veneration, as ancestors are the specific subjects of the rituals explored herein, and introducing the principal actors of this study, mid-level leaders of sites within the Belize River Valley, Belize.

Theories of Practice

Social theories provide a framework by which social scientists can empirically describe "the concrete processes of social life" (Giddens 1984:xvii). Here I draw on a body of work referred to as *practice theory* (Giddens 1979; 1984; Bourdieu 1977, 1990; Sahlins 1981, 1985), which seeks to explain the relationship between social action and the social system, and the role of individual action in the production and reproduction of society (Ortner 1984, 2006).

Practice theory is used because it maps well onto Maya worldview as understood through ethnographic and ethnohistoric sources. As detailed in Chapter 2, Maya worldview is relational - it is rooted in maintaining relationships with human and nonhuman beings in a reciprocal manner (Astor-Aguilera 2009, 2010; Monaghan 1996, 1998a, 1998b; Fischer 1999; Watanabe 1992). For example, the living provide for the life essences of the deceased so that the deceased will exert their influences in positive ways on the lives of the living. Both sides must act reciprocally so as to keep order and balance in the universe. They must act together because humans and nonhumans exist in different experiential realities and thus have different physical capabilities. Personhood itself is defined by the extent to which an individual willfully participates with his/her community in daily activities. In Maya worldview, as in practice theory, the daily actions of participants create society and society, in turn, creates participants (Monaghan 1998a:140; Watanabe 1992:90-91; Astor-Aguilera 2010:206-207). Change over time is also integral to Maya worldview, as regeneration and renewal in an ancestral form are foundational concepts (Carlsen and Prechtel 1991). Persons and their life essences are shaped by behavior over the course of a person's life (Fischer and Hendrickson 2002:85;

Watanabe 1992:90; Fischer 1999:468; Monaghan 1998a:139). In sync with Maya worldview, practice theory conceives of actors at all levels of society as actively engaging with cultural structures as they change over time. Agency, and the structures that, constrain it, are most clearly visible in the historical perspective archaeology provides.

The perspective of practice theory sees social life as recursively constituted by human agents acting within a particular sociocultural structure (Giddens 1984:2; Bourdieu 1977:72). In particular, I rely on Giddens' version of practice theory and theorization of structure and agency, particularly as elaborated by Sewell (1992), Ortner (2006) and Sahlins (1981, 1985). According to Giddens, structure consists of the "rules and resources that are recursively implicated in social reproduction and only exist if consistently reproduced over time" (Giddens 1979:64, 1984:xxi). He describes structures as possessing an inherent duality; structures are "both the medium and the outcome of the practices which constitute social systems" (Giddens 1981:27). It should be emphasized that structures are not the practices that constituted them but are "virtual" or "memory traces" (Giddens 1984:377). Structures exist only in the mind and are visible in the resources used to enact them. Also crucial to Giddens' theory (1979:64) is that the people within the social structures are shaped by those structures and, in turn, because they are knowledgeable, have the capacity to creatively innovate or improvise changes to those structures.

Giddens (1984:21) defines these "rules and resources" specifically as "generalizable procedures." However Sewell (1992) expands and refines these concepts, proposing that culture is the "procedure" with which knowledgeable actors engage. He

suggests the less structuralist term of “schema” to demonstrate that shared culture constitutes “rules” (Sewell 1992:7-8). Sewell (1992:9) explains that, according to Giddens, resources can be human, such as physical strength or knowledge, or nonhuman, such as naturally occurring or man made objects, to enhance or maintain power. Resources, as integral parts of structures, which exist only in “memory traces”, cannot themselves be virtual. Sewell (1992) suggests that resources and schemas are dually constituted, just as structure is by action, thus, “sets of schemas and resources may properly be said to constitute *structures* only when they mutually imply and sustain each other over time” (Sewell 1992: 13). Sewell (1992:15), draws on the work of Bourdieu to emphasize the point of resource duality and identifies a recursive duality between objects and mental structures explaining that, “the mind is a metaphor of the world of objects which is itself but an endless circle of mutually reflecting metaphors” (Bourdieu 1977:91). Sewell (1992:16) delves deeper into Giddens’ theory of structures to “show how the ordinary operations of structures can generate transformations.

Drawing on his reformulation and extension of Giddens’ concepts of schemas and resources, and their relationship to structure, he proposes that structures are diverse and distinct (i.e. kinship structures have different dynamics than religious structures); schemas are transposable (they can be applied to many different contexts by knowledgeable actors); resource acquisition is unpredictable (if schemas are not accessible to all then not all resources are accessible); resources are polysemic (they carry multiple meanings and can be used in multiple ways); and structures intersect (they are not isolated) [Sewell 1992:19].

Sewell (1992:19) concludes that a more useful definition of structure is, “sets of mutually sustaining schemas and resources that empower and constrain social action and that tend to be reproduced by that social action”. Thus, knowledgeable actors draw on their schema and resources, both specific to their social and historical context, and can maintain the status quo or create new structures, which provides a better explanation for social change than Giddens.

The concept of agency used by practice theorists is also helpful as a framework for understanding Maya mortuary activity. Agency has been defined simply as, “everything people do” (Ortner 1984:149). Giddens (1984:16) describes agents as people within the structure and their agency as their capability of acting intentionally, while for Bourdieu, actors are driven unconsciously by their *habitus*: systems of durable, transposable dispositions (Bourdieu 1977:72).

I take Giddens’ view that all humans have the capability of being agents and that one aspect of agency is acting intentionally towards a goal. This accords well with Sewell’s definition (1992:2) of agency as “the strivings and motivated transactions that constitute the experienced surface of social life,” and that it is also a capacity “for desiring, for forming intentions, and for acting creatively,” (Sewell 1992:21). Creativity as part of agency is crucial for allowing the system to change from within and not just due to outside forces. Otherwise, the system would be in stasis, constantly reproducing itself. However, it bears mentioning that actors certainly do not always act intentionally, nor are creative geniuses and deviants solely responsible for social change (Giddens 1984:12). As Sewell suggests, agency is not just individual capability but one inherent to groups in that, “agency entails an ability to coordinate one’s actions with others and

against others, to form collective projects, to persuade, to coerce, and to monitor the simultaneous effects of one's own and others' activities" (Sewell 1992:21). John and Jean Comaroff (1992:36) suggest that only analyzing intention does not convey the complexities of the historical context that produced that action and advise scholars to make part of their analyses the larger-scale social and political dynamics that undoubtedly affect intended and unintentional outcomes of action (see also Sahlins 1985:7-9).

For the Maya, agency is not limited to living humans. As described in Chapter 2, death is biological but not necessarily extended to the life essence of a person. Life essences are capable of action; in fact they can be described as having "agency" according to the definitions given above (Astor-Aguilera 2009:173; 2010:207). They can be called upon for favors if the living meet their reciprocal obligation to provide sustenance in the form of liquor, flowers, candles, food, etc (Astor-Aguilera 2010:205; Houston et al. 2006:123,149; Meskell and Joyce 2003:142). Importantly, being non-corporeal, these life essences have access to different resources; their capabilities include keeping illness from the family and bringing rain to the fields.

In sum, action is constrained or enabled by particular social and historical contexts. Actors have access to different resources, social and physical. The schema(s), the correct way of acting, include for example that the body should be buried in a particular location at a particular time. Ethnographic and ethnohistoric data suggest that Maya actors know the correct way to proceed with a dead body because of the intersecting structures of kinship, worldview, and cosmology.

I argue that a resource useful for continued communication is human bone itself. This particular resource has cosmological implications as it is perceived in Maya worldview to be made of corn and to have played a role in myths of regeneration and renewal (Fitzsimmons 2009:22-23). An interesting aspect of this resource is that it is unique; handling human bone is not necessarily the same as handling a pot or a stone. Considered in light of practice theory, human bone is also interesting because it is available to anyone who has a death in the family. While the elite Maya had access to resources like cinnabar, large quantities of jade and shell, mirrors, and tombs in which to inter their dead, commoners did not have these ritual resources but they had access to skeletons. Grave visitation and re-entry could also imply a system of record keeping about the dead and their location that is not available to us in the archaeological record. In order to better understand the breadth and scale of funerary rituals involving posthumous events this dissertation investigates how these structures intervene to produce what archaeologists and anthropologists call ancestor veneration among mid-level leaders within ancient Maya society, and how these people may have changed its practice over time. In the following section I provide critical definitions of terms typically used to refer to Maya mortuary behavior and evaluate their usefulness for a study of Maya worldview in light of the practice theory framework.

Practice and Ancient Maya Relational Worldviews

Cultural beliefs about death and dying are typically classified under the domain of religion (Metcalf and Huntington 1991:27-28; Parker –Pearson 2005: 168-170; Fitzsimmons 2009:11; Insoll 2004:13; Renfrew 1994:48). If mortuary practices are an

integral part of the social institution of religion then it would be useful to describe this institution, what is religious and what is not, and its relationship to the rest of society. Anthropological definitions of religion range widely and vary in their complexity (Tylor 1958[1871]:8; Durkheim 1915:52; Malinowski 1948:8, 19; Radclife-Brown 1964:ix, 234; Evans-Pritchard 1956:v, 322; Eliade 1959:106, Klass 1995:38; Graham 2011:66-80, Renfrew1994:48; Insoll 2004:6-7). For example, for Tylor (1958[1871]:8) religion was simply the "belief in spiritual beings." For Malinowski religion was within the realm of the sacred but is not easily defined, and " it includes animism, animatism, totemism, and fetishism, but it is not any one of them exclusively . . . religion does not cling to any one object or class of objects, though incidentally it can touch and hallow all" and is recognizable only where it differs from magic (Malinowski 1948:19). For others religion is a social phenomenon that promotes group cohesion (Renfrew 1994:48). Durkheim (1915:62) defined religion as, " a unified system of beliefs and practices relative to sacred things, that is to say, things set apart and forbidden – beliefs and practices which unite into one single moral community called a Church, all those who adhere to them." While religion was acknowledged to be an element of social life, it remained unclear "the exact relation between the social and the individual contributions to religion . . . It is a mode of action as well as a system of belief, and a sociological phenomenon as well as a personal experience" (Malinowski 1948:8). For Eliade (1959:106), religion is the sacralization of daily life through reproduction of a divine model of existence. Every aspect of the daily existence of "archaic" man was imbued with the sacred; it is everywhere and in all things (Eliade 1959:29, 138; 1976:137; 1990:107). Communities are established locations of divine manifestation, or hierophany, and the community will physically order itself

according to this divinely sanctioned center (Eliade 1959:32). To Timothy Insoll (2014:13) religion encompasses the part of human life that is "intangible, irrational, and indefinable." To paraphrase Colin Renfrew (1994:47), classifications have value only if they are useful (see also Graham 2011:67, Astor-Aguilera 2010:2).

Of concern here is whether the Maya considered religion and ritual to be crucial organizing principles that informed their behavior towards death and whether commoners used these acts as platforms for the negotiation of power relations. Some scholars eschew a strict definition of religion and prefer to acknowledge that the edges of this institution are fuzzy and fade into other aspects of social life (Insoll 2004; Renfrew 1994:47; Graham 2011:66-80). Astor-Aguilera (2010:2) proposes that the idea of religion has been reified and is not a necessary or helpful analytical category. Elizabeth Graham (2011:66) observes that in ethnographies of Mesoamerican cultures the term religion is used sparingly, if at all. It is not used as an institutional category, for instance as kinship or economics typically are. For example, Redfield and Villa-Rojas (1962) dedicate a chapter to "Economics" but not to religion, and to "The Invisible World," which includes a section on "The souls of the dead". However, these authors use the terms religion and ritual in their text, although it is not in the index (Redfield and Villa-Rojas 1962:75, 123, 124-125). Maya social life, Graham summarizes, is portrayed as, " . . . highly integrated and difficult to disentangle – or, to use Geertz's metaphor, as 'knotted into one another'" (Graham 2011:66). Additionally, the integration of Maya social life with ritual is evident in several recent works on ritual economy (McAnany 2010; McAnany and Wells 2008).

In a linguistic study of five Mesoamerican languages, Pharo (2007:57) finds that there was no emic description or single word in any of them that captures the Western

idea of religion. Spanish missionaries introduced Christian words to describe what they identified as Mesoamerican religion in order to interpret indigenous beliefs so they could obliterate it (Pharo 2007:58; Graham 2011:85; see also Frost 1993). Pharo finds that classifications made in Mesoamerican languages reveal that the idea of religion is, " . . . the distinctive human character in contrast to the preternatural, i.e. non-human or non-natural . . . " (2007:30). Nevertheless, he states that, "'Religion' is a European cultural category within a tradition where a secularized conception has been developed of "religion" as a distinct cultural phenomenon," (Pharo 2007:29). He concludes that using a term like religion says more about the scholar's own perception of the world more than anything else (Pharo 2007:58; Klass 1995:30; Renfrew 1994:47). Pharo (2007) used Spanish missionary documents of Mixtec, Zapotec, Nahuatl, Tarasca/Michoacan, and Maya languages.

A key aspect of definitions of religion is an adherence to a concept of activities that separate sacred and profane, natural and supernatural. If religion is not itself a useful term to describe Maya activity, is the concept of sacred useful? The Maya, ancient and modern, are often described as perceiving every object in their universe as imbued with an unseen essence or power. For example, Schele and Freidel describe the Maya world as, "alive and imbued with a sacredness that was especially concentrated at special points" (Schele and Freidel 1990:67). In their perspective, Maya kings, "were the agent[s] of power who made the transition from the sacred to the mundane" (Schele and Miller 1986:92, brackets added).

I argue here following Astor-Aguilera (2010) that this perspective on Maya worldview as having to do with the belief in the supernatural or sacred, invisible realm

where gods exist separate from man, has been perpetuated uncritically in studies of the ancient Maya. Ethnographic and ethnohistoric data discussed above describe a perspective in which the natural and the supernatural are integrated. Astor-Aguilera proposes that the Maya do not recognize a boundary between the natural and supernatural, "the make-up of Mesoamerican non-humans, then, do not fit our Western concepts of gods, deities, demons, and ghosts existing in other worlds or dimensions, passing through supernatural portals into our natural world" (Astor-Aguilera 2009:175). Thus in communicating with the ancestors there is no need to transform their present physical or mental state. When the Maya need to communicate with a non-human being they "cajole, entreat, and beseech" it through ceremonies in which they feed it, pray, chant, or dance so they can 'fix' the being to a material object, thus 'activating' the object (Astor-Aguilera 2009:174).

Fixing a non-human being to a material object is quite different from the belief that all objects in the universe are animated or imbued with sacred essence. A rock is usually just a rock (Hallowell 1960:25). When the Maya call an other-than-human being to an object, a rock for instance, to communicate with it they do not think that the rock is a 'symbol' of the ancestor. It is the ritual action of attaching a non-human being to that rock that animates it for a short time (Astor-Aguilera 2009:173, 180). To be clear, it is not the rock that is animate; it is still a rock, but with a nonhuman being fixed to it. This distinction is important because it demonstrates that the Maya saw their world as integrated, not as two separate realities that were bridged by ritual action. In Maya worldview there are other-than-human, non-material beings that are a real part of their

interaction sphere. These beings had different capabilities but they are real; they do not need a symbolic object to stand in for them (Astor-Aguilera 2010).

The dichotomy between the supernatural and the natural also perpetuates the erroneous idea that there was a distinction between the Middleworld, where humans reside, and the other worlds. If there is no supernatural/natural dichotomy then how can two, discrete locations exist? After death the deceased are still persons, but now they are persons with a different physical constitution (Astor-Aguilera 2009:173, 224; Meskell and Joyce 2003:148). Therefore, to speak of "portals" or "sacred points" or "membranes" assumes the non-humans reside in a discrete, separate location (Schele and Freidel 1990:69, 73). The physical constitution of humans keeps them from experiencing the same existence as other-than-humans, but the corporeal and non-corporeal do not exist in vertically separated landscapes.

Mircea Eliade, an historian of world religions, sought through his work to identify a pan-human "essence", a heirophany, that unified religious experience across cultures. Eliade assumes that use of the natural world to represent aspects of a belief system is an essential aspect of 'primitive' religions. Eliade relies heavily on the utilization of natural symbols, like the temple/Cosmic Mountain concept and the connection of the earth with the Underworld by way of the World Tree (Eliade 1959, 1990). Mayanists tend to draw heavily from Eliade's work (Freidel 1992: note 4). Almost any text that describes ancient Maya religion and cosmology could have been taken straight from Eliade's cross-cultural conception of religion. For example,

The world of human beings was connected to the Otherworld along the *wacah chan* axis which ran through the center of existence. This axis was not located in any one earthly place, but could be materialized through ritual at any point in the natural and human-made landscape. Most important, it was materialized in the person of the king, who brought it into existence as he stood enthralled in ecstatic visions atop his pyramid-mountain [Schele and Freidel 1990:67].

Iconographically, the "World Tree" is represented in public ceremonial and ritual contexts, and I do not mean to argue that it did not exist or was not cosmologically significant (see Newsome 2001; Ruz 1968; Schele and Miller 1986). However, the role of these natural manifestations and the concepts, sacred/profane and natural/supernatural, have been applied uncritically to the data on Maya culture. Recent work calls for further exploration of these concepts (Fitzsimmons 2009:42).

For this dissertation, I use the concept of a worldview that can and is acted upon by the Maya in certain times and places. I define worldview as "philosophies that allow people to interact with other people, their environment, and the specifics of their day-to-day lived experience" (Astor-Aguilera 2010:77). As discussed in Chapter 2, I use cosmology here to refer to the Maya understanding of their relationship to the physical, geographic landscape (Astor-Aguilera 2010:17, 23).

From Practice to Ritualization: Materializing Maya Worldviews

For this study I maintain that the Maya did not maintain a religious practice. The term ritual, like religion, is also potentially problematic (Monaghan 1998b:48). It is

assessed here for its usefulness as a concept for studying ancient Maya mortuary practices using a theory of practice.

Ritual is intimately tied, in Western thought, to ideas about religion (Bell 1992; Grimes 2000; Renfrew 1994). Many theories of ritual agree that ritual action is separate from everyday, typical, quotidian activities, and that it is repeated and, to some degree, formal and invariant (see Grimes 2000; Bell 1992:74; Snoek 2006; Henn 2008:23; Tambiah 1979:19; Turner 1967:19, 1969:158; Rappaport 1979:175, 1984:4). However, when combined with theories of practice, rituals are not necessary invariant and formal. They can be responsive to their historical and temporal context.

For this dissertation a definition of ritual is composed from the work of Catherine Bell (1992) combined with the one given by Henn (2008) as they employ the concepts of practice theory. The first parts of Bell's definition are akin to others that place ritual action apart from typical activities. These set-apart actions have to do with realities that are not necessarily within the realm of human capability. Bell (1992:74) uses the term 'ritualization' and defines it as "a way of acting that is designed and orchestrated to distinguish and privilege what is being done in comparison to other, usually more quotidian, activities . . . ritualization is a matter of various culturally specific strategies for setting some activities off from others . . . for ascribing such distinctions to realities thought to transcend the powers of human actors." Bell (1992:94) goes on to emphasize that a concept of ritual integrated with practice theory allows for ritual to not be conceived of as a fixed, invariant, formal act. On the contrary, formality and repetition are only two strategies for ritualization. Depending on the cultural logic and context,

ritualization can be informal, quotidian, and variable if the actors chose to use it strategically as such.

Henn (2008) explains that there is a crucial temporal component to ritual that must be considered, in that there should be historical precedent for an activity for it to hold meaning, even if it is not enacted precisely the same way each time. Therefore, ritual is temporally contingent; it is contextual and slightly different given the time and place. Bell (1992:100) pays attention to agency and the structures that constrain the outcome of action by acknowledging that ritualization is also, "the strategic manipulation of 'context' in the very act of reproducing it." Henn also argues that there exists a "creative relationship between communication and performance" (Henn 2008:23) such that it is relational and practical. Drawing on Bourdieu's concept of *habitus*, Henn concludes that rituals are, at the very least, recursive and self-generative as they are enacted out of memories and so reformulated for a particular place and time (see also Turner 1969:158). Thus, the term ritual is used as a productive, relational, contextual activity that, for the Maya, was the process by which reciprocal relations were maintained. Ritual is "productive", according to Monaghan, in that it constitutes, "a set of ideas about how people create and maintain the conditions of their existence" (Monaghan 1998b:48).

To summarize, I draw on ethnographic and ethnohistoric data, presented in Chapter 2, to illustrate that ancient Maya worldview is relational. Modern anthropological scholars studying religion argue that some cultures may not have a "religion" as Westerners understand it, including conceptualizations of distinctions between sacred and profane, natural and supernatural. A lack of duality between the natural world and supernatural beings is clearly seen in Maya cosmology; non-corporeal

beings exist but have a different physical experience of the natural world than humans. Some of these non-corporeal beings are remnants of the life essences of the deceased. They can still be communicated with through material objects. In fact, it is important to maintain relationships with these non-corporeal beings, which can only be done by living humans if the non-corporeal beings are attached to a material object within the human experiential realm. While all people understand that non-corporeal, other than human persons exist, not everyone knows how to effectively communicate with them to keep them happy. These relationships exist within the structures of society, the schemas and resources available to actors based on their own context. The materialization of these relationships, the type of objects used, how frequently, and in which contexts, are accessible as archaeological data. In the following, I expand on the aspects of this study that emphasize individual and group differences, in terms of social inequality and access to resources. I also assess the anthropology of ancestors, as these individuals were likely the chosen recipients of post-interment rituals.

Ideology

Theorizing ritual action and practice prompts a discussion of ideology. As discussed above, structures provide actors with resources that will be contextually dependent (Giddens 1984); not all people will have access to all types of resources. The present research is focused on commoners, particularly mid-level sites (see below). Ideology is discussed here because it has been used in anthropological archaeology in the Marxist sense, that ideology naturalizes social differences while maintaining unity through a shared belief system (Lohse 2007; see also Shanks and Tilley 1982:130).

Ideology is typically defined as commonly held belief systems that explain or legitimize a group's existence and are used strategically by the most dominant group in society – typically the one who also exudes the most economic influence – to maintain their precedence (Earle 1997; Lopez-Austin 1988).

Models of ancient Maya sociopolitical power are predicated on the proposition that Maya society was held together, albeit loosely, by a shared ideology between rulers and commoners acknowledging the king's right to govern (Demarest 1992; Freidel 1992). The ancient Maya kings materialized their power in grand ritual displays that supposedly stunned the *hoi polloi* into compliance (Demarest 1992; Freidel and Schele 1988; Schele and Miller 1986; DeMarrais et al. 1996).

Some scholars of Mesoamerican culture maintain the idea that ideology promotes inequality but use language based less in material resources and domination. For example, Elizabeth Brumfiel (1998:3) defines ideology as "a system of values and ideas that promotes social behavior benefitting some classes or interest groups more than others." Along these lines, Lohse (2007:6-7) emphasizes communication when defining ideology as "not simply a shared belief system but rather communication-based strategies for maintaining the various social positions archaeological subjects clearly held . . . ideology pertains to symbolic communication between parties (individuals or collectives) in ritualized practices for the purpose of shaping social relations." These re-framed definitions de-emphasizing the maintenance of inequality place more power in the hands of non-elite parts of society, which is a useful framework for this dissertation.

Bell (1992:190-192) suggests that ideology is not a single, coherent unifying dogma. Rather, multiple, potentially competing, ideologies exist within one society (see

also Friedrich 1989; Giddens 1979; Lohse 2007; Mann 1986; Thompson 1984; Therborn 1980). This conception of ideology is in line with the way that practice theory conceives of human action in society; that it is recursive, temporally and historically contingent, and capable of creating and sustaining multiple ideologies. I follow Astor-Aguilera (2010:78) in defining ideology as political interpretation of social values, or worldview, in specific historical and sociopolitical circumstances, a definition that finds support in sociological theory. Therborn (1980:1) explains that the study of ideology should be an examination of how ideology operates "in the organization, maintenance, and transformation of power in society."

In the last 20 years there has been an increase in the amount of scholarship dedicated to understanding the lives of all segments of society, particularly those of commoners (Ashmore and Wilk 1988; Gonlin and Lohse 2007; Lohse and Valdez 2004; Lucero 2003, 2010; McAnany 2004, 2013[1995]; Robin 1999, 2012ed, 2013; Yaeger 2000; LeCount and Yaeger 2010; Canuto and Yaeger 2000; Webster and Gonlin 1988; Iannone and Connell 2003). Lohse (2007:13) uses Giddens' structuration theory to argue that if schemas (Giddens' rules) are about knowledge and knowledge is contextual and constructed of memory traces then there is no reason that historical memory should be only an elite domain. Ideology, he argues, is symbolic communication ritualized to shape social relations. However, anthropology, historically, lacked theorists who considered the role of the commoner in the ideology process as other than passive and accepting. Clearly he is arguing that commoners can be productive users and producers of symbolic systems. Ideology is the link that communicates unique worldviews to other groups through rituals and material culture (Brumfiel 2004; Holland et al. 1998). As noted in

Chapter 2, human bone plays an important role in Maya creation myths, suggesting it may have been a ritual resource for the ancient Maya. I argue, in line with McAnany (2013 [1995]), that one way that commoners participated in ideology is through ritualized interaction with the deceased bodies of particular people. As Bell argues, “the strategies of ritualization are particularly rooted in the body, specifically, the interaction of the social body within a symbolically constituted spatial and temporal environment” (Bell 1992:93).

The human body is often cited as a location of power and control in complex societies, in line with the dominant ideology thesis (Houston and Cummins 2004; Lopez-Austin 1988). Houston and Cummins (2004:362) propose that “the control of one body by another lies at the heart of social inequality”. Ethnohistoric evidence shows that Postclassic Maya elites considered themselves to have been molded from different material than non-elites (Marcus 1992:240), and that such physical differences predicated different funerary practices across social strata (Haviland and Moholy-Nagy 1992:53). Physical difference was reinforced by shaping the skulls of infants and filing or inlaying teeth with precious stones (Tiesler 2000, 2014; Meskell and Joyce 2003:48). The sources of such ethnohistoric accounts, however, were the elite or royal members of society and commoner perceptions are largely unknown (McAnany 2013[1995]: xxiii, 157).

Conclusion

The fundamental rule for membership in contemporary Maya society is community participation (Astor-Aguilera 2010; Fischer 2001; Monaghan 1998; Watanabe 2004). Membership is also represented by participating in the renewal and regeneration of the community through agricultural production and human reproduction. As such, Maya worldview is naturally analogous to some ideas proposed in practice theory. The social world is constituted and reconstituted, recursively, through participation and interaction by human and non-human beings. At a broader level, social structures, constituted by cultural schema and resources, both physical and mental, will shape how that participation and interaction are materialized in the archaeological record. Aspects of interment may also have been shaped by who the person was during life, their biological sex and age at death. Access to ephemeral resources like ritual knowledge may have constrained or allowed the re-entry of certain interments by the living. These schema, the cultural "rules" that are followed in practice and are reconstituted through action, are not always found within the realm of what Westerners conceive of as "religion". They are more aptly described as part of strategic ritualization of ideology that materializes relationships with non-corporeal beings. In the following chapter, I provide a model for ancient Maya sociopolitical organization and demonstrate that the principles of Maya worldview described in Chapter 2 are a fundamental part of that organization. I also introduce and define the main subjects of this dissertation – leaders residing at mid-level settlements in the Belize River Valley.

CHAPTER 4: ANCIENT MAYA SOCIOPOLITICAL ORGANIZATION AND MID-LEVEL CENTERS

In the following chapter I discuss a model for ancient Maya sociopolitical organization and the place of ancestor veneration within it. It must be noted that there remains no agreement on the details of ancient Maya sociopolitical organization (Chase and Chase 1996b). A complete history of the competing theories of ancient Maya sociopolitical organization is beyond the scope of this dissertation. I begin by describing a model for the ancient Maya state that incorporates Maya relational worldview, that of 'galactic polities', and 'segmentary states' (Demarest 1992; Houston 1993; Tambiah 1977). These two models of social organization have been applied productively to ethnohistoric and Classic period archaeological data, although as more archaeological data are amassed they likely will need revision (Chase and Chase 1996b). The idea of segmented factions of lineages may be a productive model for mid-level centers, however, and the context for their use of ideology and ritual. I go on to discuss the roots of authority held by Maya kings, which was gained, in part, from the aspects of worldview given in Chapter 2, which emphasize maintaining relationships with deceased, non-human beings. Authority gained, in part, from ritual communication with the deceased through ancestor veneration and sociopolitical organization of segmentary states are concepts wedded by Patricia McAnany (2013[199]) in her thesis that ancestor veneration was a deeply rooted, non-elite social institution that was politicized by ancient Maya kings in the Classic period. The chapter concludes by defining the subjects of this dissertation, mid-level centers, within the Belize River Valley.

Ancient Maya Sociopolitical Organization

Demarest (1992) provided a model of ancient Maya political organization as akin to Southeast Asian galactic polities (Tambiah 1977). Even though the work was published over twenty years ago it remains a useful model supported by archaeological data. In terms of the strength of ancient sociopolitical units, galactic polities are weak, decentralized states characterized by competition between neighboring polities, political instability, and rulers that strove for control of trade for sumptuary goods necessary for public performances and warfare (Demarest 1992:149). For the ancient Maya, these polities corresponded to the major cities such as Tikál, Calakmul, Caracol, Copán, and Palenque, and their surrounding hinterlands. The key unifying theme tying all these components together is a shared ideology between all members of society. Demarest builds the case for galactic polities as a model for the ancient Maya civilization by laying out three different aspects of state power – the importance of elite political interaction and competition through trade of exotic goods, ritualized warfare, and lack of state control in intensive agricultural production.

First, Demarest states that archaeological data on subsistence patterns show that kings did not control trade of utilitarian goods or food. Instead, economic exchange systems were focused on items that were ideological in nature, including jade, fine ceramic vessels, quetzal feathers, and obsidian (Demarest 1992:143). Objects like jade and quetzal feathers were crucial symbols of the ruler's power that were worn during public performances, while ceramic vessels could be given to other rulers as gifts or to lesser nobles to ensure allegiance. It was critical to maintain the material symbols of

rulership in order to do the correct rituals and performances. In this model there is a distinct competitive rivalries between “peer polities” (Freidel 1986).

Second, he argues that warfare, which is cited as a tool typically used by states to enforce control of subordinates and gain territory, was not the only way that warfare was used by the ancient Maya kings. Inscriptions glorify winning battles and show the humiliation of the defeated, although defeat did not always mean that the loser was necessarily politically dominated. Copán lost their king in battle to a neighboring polity, Quirigua, however, the deceased king’s successor was not the king of Quirigua but a local lineage member (Demarest 199:144). Since control of a network of relationships was the essence if kingship within galactic polities, for the ancient Maya warfare is described as another form of elite interaction that laid the groundwork for alliance building and information exchange (Demarst 1992:144; Freidel 1986). Warfare was a display of power and ensured access to trade networks, as well as providing captives for enslavement and sacrifice. Rather than serving only to increase territory, warfare gained sacrificial victims, slaves, alliances, and claim to tribute.

Third, in many state societies managing food production is a key aspect of state control, something that the data from the Maya region does not support. The rain-forest ecosystem is a fragile one that can only be exploited if managed well. The best way to manage it is through a diversity of methods and by dispersing humans on the landscape. We see archaeological evidence for a diversity of agricultural strategies. Canals, raised fields, swidden (slash and burn), and terracing of hillsides were all ways that the Maya produced food in their fragile ecosystem. Archaeological data from Caracol show such an extent of terraced fields, particularly near the center of the city, suggest that the state at

Caracol did in fact control some aspects of food production. Clearly, the extent to which the state could exercise control of various aspects of life varied considerably between kingdoms. The weak centralized leadership of the state is also apparent in the cycles of rise and decline that Maya states experienced over time (Marcus 1993).

One possible resource under state control not discussed by Demarest, but which has gained prominence in the literature on ancient Maya resource use, was water (Houston and Inomata 2011:245; Lucero 1999; Scarborough 1998, 2006). In the tropics, water is plentiful in the wet season but very sparse in the dry season, and relief is unavailable from open bodies of water as few exist in the northern and southern Maya lowlands. In and around many Maya cities large reservoirs were built to retain water in the dry season. They used the natural topography to move water from reservoirs to fields and residences. Controlling access to potable water may have been a key factor of royal power. Control of water may not have been a major interest of the state in places like the Belize Valley, whose rivers provided plenty of water for drinking and farming.

An important foundation for the model of ancient Maya states as galactic polities is that ancient Maya political history is characterized by cycles of consolidation and fragmentation (Marcus 1993). For example, in the Late Preclassic period there were a number of cities in the southern lowlands and highlands that reached distinct apogees – El Mirador, Nakbe, and Kaminaljuyu in particular. The rulers of these cities built some of the largest temples in the Maya lowlands, from any era, and clearly commanded power and labor. They were abandoned, for reasons that remain elusive, between A.D. 100-300 and never recovered (Sharer and Traxler 2006:285). Sites that were strong in the Late Preclassic did recover, including Tikál. Tikál and their competitors, Caracol, Calakmul,

Palenque, and Copán and others, dominated the political landscape in the Classic period. Although each polity experienced their own political trajectories of success and defeat, these polities did reach their apogee simultaneously in the Late Classic period, producing the height of the ancient Maya civilization (Sharer and Traxler 2006:711). Sharer and Traxler (2006:714) argue that the states of the Late Classic period do not exemplify the weak state/galactic polity model but that they were more characteristic of strong states. Rulers commanded enough power to construct large water management systems, some cities seem to have taken on the management of intensive agriculture (Chase and Chase 1998:62), likely managed marketplaces for the redistribution of goods within their cities, and, based on information from inscriptions, maintained a hierarchy subordinate nobles overseen by the king. Thus, these authors suggest that at their peak Maya cities could be characterized as strong, cetnralized states (Chase and Chase 1996b; Chase et al.1990; Sharer and Traxler 2006:713-714).

The sociopolitical changes of the Terminal Classic period were the beginning of the end of Classic Maya civilization. By the Terminal Classic, these major Maya kingdoms were on the decline, but other parts of the Maya area weathered the changes for a short period. Sites in the Belize River Valley, discussed in more detail in Chapter 6, prospered into the Late Classic period but began to lose population in the Terminal Classic (~A.D. 800-900) (Hoggarth 2012; Robin 2013). Similarly, the cities in the northern lowlands, in the Yucatán Peninsula, saw a dramatic rise in power and economic influence in the Terminal Classic and Postclassic periods (Sharer and Traxler 2006). In addition to control of resources, royal power was linked to both the individual's lineage as well as displays of personal power and charisma.

Ancient Maya Royal Authority and Legitimization

Reconstructing the worldview of the ancient Maya (see Chapter 2) is important because it is a key element of their sociopolitical system. Ancient Maya worldview can be characterized as relational, since humans are responsible for maintaining balance in the universe through correct action and behavior, which include maintaining relationships with humans and non-human persons through ritual acts (Astor-Aguilera 2010). To neglect these interactions, by denying non-human beings the sustenance they require, materialized as human flesh, corn, alcohol, candles, and flowers, risked bringing bad fortune to one's home by disrupting the balance of the universe. Critical to this worldview is a sense of responsibility to the community, which includes deceased ancestors.

Houston and Stuart (1996) describe this sense of duty and loyalty as part of the "moral authority" that underlay Maya communities. Morality, they discuss, is a culturally specific value system that defines proper action (Houston and Inomata 2011:28). All participants in Maya society likely were responsible for maintaining relationships in the correct way, and this maintenance was opulently carried out by ancient Maya kings. John Monaghan (1995; 2000) describes this morality as a "covenant", wherein the humans are indebted to non-humans who provide corn, rain, and good health, and the non-humans are similarly indebted in this reciprocal relationship for the food and communication given them by the living. The foundation of ancient Maya royal power, then, was the shared belief by commoners and royals in the moral authority in the person of the king (Sharer and Traxler 2006:715; Houston and Inomata 2011:160-161; Houston and Stuart 1996:306-308). It is important to note that rulers were not

always regarded as good and benevolent leaders; ethnohistoric and epigraphic data indicate that some leaders were aggressive and exploitative (Houston and Inomata 2011: 160; McAnany 2013[1995])140-143, 148-149).

Kings and queens inherited their kingship through their biological families, through either the patriline or the matriline. Accessing legitimacy through both lines gave the royal dynasty more political stability (McAnany 2013[1995]:128). Houston and Inomata (2011) describe the source of royal power as the *k'uh*, described in Chapter 2. *K'uh* is a life essence that resides in the blood and is associated with heat and the breath. Because one can change and manipulate one's life essences over the course of one's life (Monaghan 1998), correct ritual action can build up the *k'uh* of the king, and a competent ruler is seen as possessing a large amount of *k'uh*. This sets them apart, physically, from other nobles and certainly from non-elites. Performance of the correct rituals, including communicating with important ancestors helped Maya kings accrue power. Through action the king's power coalesced within him. Repeatedly engaging in rituals of communication with ancestors, of erecting monuments to them, kings fomented more *k'uh*. Kings who lived in to their 60's and beyond are described in inscriptions as being particularly powerful and potent rulers (Fitzsimmons 2009:171).

The above discussion presents a model of how Maya sociopolitical dynamics and worldview worked, but it is a top-down perspective. The masses of non-elite Maya play a passive role, and it is one aim of this dissertation to address the extent to which ideology was accessible and useful to non-elties. Data are lacking to inform on the role that the non-elites played in these performances, besides as spectators. They were almost certainly involved in the construction of the causeways, temples, and plazas within which

the lavish performances and parades took place. Construction often took place at particular points in the ritual and solar calendar (Houston and Inomata 2011:247) which likely inspired feelings of inclusion and contribution towards the elite role of ritual performance. Patricia McAnany's (2013[1995]) work best developed the role of non-elites in the broader sociopolitical system.

Ethnohistorians Carmack (1981) and Fox (1987) proposed a model for Quiche Maya sociopolitical organization based on the segmentary state concept originally developed by Southall (1957, 1988) for the African Alur society. Aspects of this model have since been applied to the Classic period lowland Maya (Houston 1993; McAnany 2013[1995]:146-156). Segmentary states lack unification, rather, they consist of lineages that split into competing factions. Factions are defined by Brumfiel (1993) as small groups in direct competition for resources and political power (McAnany 2003[1995]:146).

In Southall's (1988:62) Alur model, a royal lineage may segment when a son must live elsewhere so as not to compete with his father, the king. Or, he may live elsewhere to secure resources for his father. In the ancient Maya hieroglyphic inscriptions we see the sons and brothers of kings placed as vassal rulers in other cities, such as the case when a son of the king of Tikál was sent to Dos Pilas, who may have only been only 4 years old at the time (Martin and Grube 2008; Sharer and Traxler 2006:383). In this case, the son turned on his father at Tikál and became leader of his own faction, allied with Tikál's enemy, Calakmul (Sharer and Traxler 2006:387).

For commoners, lineages may split for economic reasons related to land use. Lineage landholdings can only support so many people until more land is necessary. Of

course, disputes of any kind could cause a lineage to split, as well. Over time, different segments of the same lineage can gain access to different resources creating a complex, competitive sociopolitical landscape. McAnany (2013[1995]:147) explains that, "the 'commoner' population was composed not of an undifferentiated mass but rather of many distinct factions and lineages which were in and of themselves highly structure and internally differentiated". Inter-lineage warfar was well documented in the ethnohistoric literature from the northern Yucatán (Roys 1957). McAnany (2013[1995]:148) provides a Late Classic period example of segmented power relations at the site of Copán. The king, Yax Pac, was depicted dedicating local, non-royal lineage shrines. Fash (1991) interprets these rituals as efforts by Yax Pac to integrate these lineages and avoid the formatin of rival factions. McAnany (2013[1995]) describes Classic Maya society as shaped by centrifugal and centripedal forces of kingship and kinship.

The thesis of McAnany's work is that the veneration of ancestors was practiced over generations by ancient Maya non-elite, and that it was appropriated and politicized by emergent kings in the Late Preclassic period to "sanction elite power and authority" (McAnany 2013[1995]:127; Freidel and Schele 1988; Freidel 1992). As Houston and Stuart (1996: 309) describe, "the grafting of ever-changing ideas about political power on to more broadly held concepts about the nature of the universe probably made those notions more compelling to royal subjects". The Classic period kings used their genealogy to indicate their powerful antecedents and to demonstrate ancestral approval and support. However, Houston and Inomata (2011:63) acknowledge that it is unlikely the kings ever fully controlled or monopolized all contact with the ancestors. Archaeological data, reviewed in more detail in Chapter 6, indicate that practices

associated with ancestors – repeated interment of individuals of a particular age and sex within structures associated with the east, instruments of ancestral communication, like bloodletting implements, placed in graves, ceramics marked with the quadripartite motif – persisted at non-elite sites throughout Maya history. McAnany's (2013[1995]) model of ancestor veneration and political appropriation by the elite remains valid.

Another aspect of McAnany's thesis was that the presence of ancestral material culture and practices at non-elite sites suggests that non-elites adhered to a lineage based form of social organization. Ethnohistoric literature concerning the Yucatec Maya recount that the Maya had lineage heads, *ah kuch kabob*, who held political power and formed the bridge between lineage groups and centralized power in the Maya lowlands by facilitating collection and payment of tribute (McAnany 2013[1995]:9, 117). McAnany's work brings to the fore a tension between kingly power and authority and the powerful bonds inherent in kinship relations at the level of the commoner.

In sum, a model of ancient Maya sociopolitical structure is rooted in a worldview holding that balance must be maintained in the universe through appropriate ritual action. Not every human is capable of such action and ancient Maya kings and queens, consisting of a greater concentration of heat and vitality, *k'uh*, were capable of managing this delicate balance, which included communicating with deceased ancestors. The ancient Maya kings strove for economic control, particularly of long distance trade for exotic, sumptuary goods used in elaborate performances and maintained relationships with fellow kings and nobles in other cities. The rest of the Maya populace shared this worldview and thus acquiesced to their place in the social hierarchy. They may have felt an allegiance to a king and city through participation in construction in the city centers

and by participating in ritual circuits that brought the king from the city to do rituals at secondary centers. While the kings did not seem to entirely control local food production, or water supply, both for drinking and irrigation, was one means that the Maya kings may have wielded economic control over their realms. These were the centripedal forces the held together ancient Maya sociopolitical structure.

However, centrifugal forces drew the populace away from the king and the center. The king's power was inherently unstable because he did not directly control agricultural production or land, although some may have by the Late Classic period. Practicing intensive agriculture in the fragile rainforest ecosystem necessitated a dispersed population that did not clear too much forest, nor farm any one piece of land too intensively, to avoid depleting the soil of nutrients. Lack of economic control meant that the constituents could leave the king's realm if another monarch was more successful or benevolent. The kings and queens represented themselves and their ancestors as lineage members, lineages also structured commoner social organization. Ancient Maya sociopolitical organization represents a tension between lineage organization and the political institution of kingship. Kingship is well represented iconographically and glyphically. Absent from this model is a deeper understanding of how ancient Maya non-elites practice their worldview apart from the kings at the city centers.

In the following section, I describe the main subjects of this dissertation – the ancient Maya occupants of mid-level sites. As discussed above, ancient Maya sociopolitical organization is complex and represented a tension between kingship and kinship. Power was not strongly held by the state; crucial to our understanding of the relationship between worldview, power, and sociopolitical organization is how

institutions, like ancestor veneration, were used by social groups represented by mid-level centers. Mid-level centers were defined using settlement patterns, which are described in the following sections.

Defining Mid-level Centers

Mid-level centers were initially identified in the Belize River Valey through settlement pattern research (Willey et al. 1965). Describing the settlement patterns of a region takes into account the relationship between of the dispersion of human habitation with the surrounding natural environment, the function of the structures within that location, and the spacing, form, and size of these groups of structures with respect to other groups (Iannone 2004:274; Willey et al. 1965:15). The general goal is to understand the entire continuum of settlement types, and the structures that compose those types. Settlement surveys in the lowland Maya region have revealed a great deal of variability in site configuration and structure type (Willey et al. 1965; Bullard 1960; Ashmore 1981). The settlement continuum in the central and eastern Maya lowlands has generally been grouped into three types: house ruins, minor ceremonial centers, and major ceremonial centers (Bullard 1960; see also Willey et al. 1965).

House ruins are described as clusters of small structures. They are recognized as being abundant on the landscape and small in size and were thus labeled as houses by both Willey and colleages (1965) and Bullard (1960). Willey et al. (1965) confirmed through excavation that the ubiquitous small mounds were houses. Minor ceremonial centers are, “ . . . a class apart: appreciably larger than the House Ruins, and appreciably smaller than the Major Ceremonial Centers” (Bullard 1960:359). Bullard (1960: 367-368)

recognized that settlement seemed on cluster around Minor Centers, suggesting that their function was as a, “religious or civic center for the community”. Major Ceremonial Centers were substantially larger than Minor Centers and were the nuclei of surrounding “districts” that consisted of settlements and Minor Centers. Iannone (2004:276) describes Bullard’s (1960) typology to be the first sophisticated approach to categorizing ancient Maya settlement. The scheme did not encompass all variability, though.

Other scholars acknowledge a need to incorporate the greater diversity seen in ancient Maya settlement (Hammond 1975). Hammond (1975) further classified each tier until there were nine levels of settlement elaboration. Ashmore (1981) refined this more extensive typology based in part on the settlement surveys in other parts of the Maya lowlands. Iannone (2004:278) states that the Minor Ceremonial Center is passed over in these configurations.

Thus, Iannone (2004) suggests a return to the tripartite scheme outlined by Bullard (1960) consisting of lower-level, mid-level, and upper-level settlement types, but with the caveat that each type exists on a continuum. Lower-level settlement consists of “the most basic unit of analysis – Bullard’s (1960) solitary ‘housemound’” and include Bullard’s (1960) “housemound cluster” (Iannone 2004:279). These may be considered, typically, only residential in function but some may be more elaborate than others because as these groups of housemounds develop into larger settlement with a higher number and more elaborate structures.

Mid-level sites, at one end of the continuum, are residential in nature but have, “at least one large nonresidential structure” (Iannone 2003: 280). At the other end of the continuum, mid-level sites are Bullard’s Minor Ceremonial Centers, distinguished by

their greater size, spatially and in structural volume, and site plan complexity with an increase in non-residential buildings (Iannone 2004:281). Mid-level sites have public plazas rather than private patios and structures like ancestral shrines (Iannone 2004:281). In some cases, mid-level sites have features like ballcourts, stela, altars, and causeways, features typically associated with upper-level settlement. To Iannone (2004:282; see also Connell 2000; Iannone and Connell ed. 2003) these features imply a degree of autonomy, possibly semi-autonomy, in the developmental trajectory of mid-level sites.

Upper-level settlements are significantly larger, in terms of spatial extent and building size, than mid-level sites. Iannone (2004: 282) states that while there is a continuum along which upper-level settlements exist, there are "core traits" by which they can be characterized. Namely, upper-level settlements consist of ballcourts, steae, altars, causeways, and vaulted bulidings. The difference in quality and quantity in buildings, particularly non-residential buildings, as well as artifacts, distinguish upper-level settlements (Iannone 2004:282).

Iannone's (2004) designations were used to organize the data set used in this dissertation. In addition, I define mid-level centers as sites that have a pyramid of 5-7m high and one to two public plazas (Driver and Garber 2004). The Belize River Valley has been the epicenter of middle-level settlement research since Willey and colleague's (1965) pioneering survey. At least eighteen middle level centers and settlements have been documented and systematically excavated in the upper and central Belize Valley. Hence, we have an opportunity to understand how these sites relate to each other and to the rest of Maya society better than in any other part of the Maya area. Driver and Garber (2004) found that middle-level settlements in the central Belize Valley, often located on

prominent hilltops, are located between upper-level settlements and about 2km from each other, a pattern also observed by Norman Hammond at Nohmul in northern Belize (1975:42). Middle-level settlements can be grouped according to variation in architectural complexity (Driver and Garber 2004:291). Dividing these sites into three types, Driver and Garber (2004) hypothesize that each type served a function for a nearby major center from integrating the hinterlands through ritual, to controlling arable land and water resources, to managing socioeconomic interactions in boundary zones between major centers (Driver and Garber 2004:291-292). The middle-level sites were likely autonomous to some degree. This pattern may only be applicable to the Late Classic period in the Belize Valley, as only two of the sites in Driver and Garber's sample show occupation prior to the Late Classic.

Greater Mopan River Vally Settlement Patterns

Dispersed settlement and lack of clear centralized leadership has been observed at several other locations in the lowland Maya region, including along the Mopan River in southeast Guatemala. The Mopan River flows north from the Dolores-Poptun plateau in southeast Gautemala to its convergence with the Macal River, which originates in the Maya Mountains, near the ancient site of Cahal Pech. The two form the Belize River, which flows east to the Caribbean. The nature and structure of sociopolitical power in the Maya lowlands is complex and varied (Ashmore 1981; Houston and Inomata 2011). Some regions appear to have been highly centralized states while others are characterized by dispersed settlement and lack a clearly defined, strong center or evidence of state involvement in economic pursuits and resource control, like agriculture or water. Laporte

and Mejía (2005:28) suggest that to confront this variability archaeologists should focus on the naturalization of power in each particular region and consider that multiple types of sociopolitical organization could have existed simultaneously. Laporte and colleagues used settlement data from southeast Guatemala support this proposition. Along the lower, middle, and upper Mopan river valley the settlement is characterized by a higher number of secondary centers and dispersed settlement without evidence of one overarching political power. The settlement continuum is similar to that observed on the other side of the border in Belize, with some nucleated settlement surrounded by varous minor centers (Laporte and Mejía 2005:41). These are described as possibly being lineage segments that broke off from the main lineage. Laporte and Mejía (2005:45) hypothesize that the sites along the Mopan played a role in trade between the Petén and the Caribbean and this may have helped them maintain autonomy. These sites were also situated close to lithic sources in the Maya mountains that were not available in other parts of the lowlands (Laporte and Mejía 2005:162).

Importantly, the settlement data from the neighboring river valley to the west shows a different pattern. The Salispuedes river vally lacks minor center "segments" and is characterized by nucleated centers and very dispersed settlement not clearly associated with any one center (Laporte and Mejía 2005:76). Further north, towards the lakes of the central Petén, there are even fewer secondary centers and the landscape is dominated by major urban cetners like Tikál, Yaxha, and Nakum. The Chiquibul river valley, located east of the Mopan river valley, is similar to the Mopan settlement patterns, with numerous secondary centers. The influence of the major site of Caracol was undoubtedly experience by some of these sites, however.

The Río Bec region has also been described as a settlement region “without a king” (Michelet et al. 2010; Nondédéo et al. 2013). Assessment of settlement patterns shows that the region was populated in the Classic and Late Classic period with small-sized monumental groups of residences that lacked an epicenter (Nondédéo et al. 2013:392). Instead, the excavators suggest that the multiple lineages, or “houses” (Gillespie 2000a), in the Late and Terminal classic were allied with each other but none ever grew to dominate. They, too, suggest that a local economy based in agriculture may have produced this dispersed settlement and that it may not be seen in places where trade or crafts were more important economically (Nondédéo et al. 2013:393).

Clearly, the ancient Maya of the central and eastern lowlands maintained a complex sociopolitical system. As Laporte and Mejía (2005) suggest, the nature of power at a regional is a productive line of inquiry since different forms of sociopolitical organization may have existed simultaneously. Mid-level sites hold great promise for the investigation of the strategic use of ritual and ideology by a segment of ancient Maya society. Many of the sites have eastern structures that imply some degree of ritual autonomy. They are hypothesized to have been the most dynamic within the sociopolitical system because they were forced to constantly negotiate their place as the influence of major centers, whose power was very unstable, expanded and contracted over time (Marcus 1993; Iannone and Connell 2003). The following chapter lays out the research design of the project, based on this model of ancient Maya sociopolitical organization, providing more detail and reasoning for application of each bioarchaeological method.

CHAPTER 5: RESEARCH EXPECTATIONS

Ancient Maya mortuary practices are complex, as are the social institutions and organizations that governed them. I approach these complexities in this dissertation by collecting multiple types of evidence. As Wylie (1989:11-16; 1992:28) suggests, it is necessary to use multiple lines of evidence to mutually reinforce interpretations of archaeological data. It is not just the diversity of evidence that is critical, but that the "constituent strands draw on different ranges of background knowledge in the interpretation of different dimensions of the archaeological record" (Wyllie 1989:15). In this dissertation, I draw on ethnographic and ethnohistoric sources, the 'background knowledge' referred to by Wylie (1989), from different aspects of Maya ritual and social life to produce a hypotheses for how ancient relationships were maintained between the living and the dead among mid-level sites in the Belize River Valley and how these practices changed over time.

The preceding chapters provide context for ancient Maya worldview and social integration. In the following, a set of four expectations are proposed that test aspects of this model with the ullimate goal being a more nuanced perspective of how woldivew and ideology function at all levels of the anicnet Maya social hierarchy. I begin by providing information on the extent to which commoners moved across the ancient landscape.

Expectation 1: Commoner Mobility

Expectation 1 states that elderly male individuals who were born and raised locally were typically chosen for interment in eastern shrines and for veneration as ancestors. The ancient Maya kings and queens were often depicted associated with styles and iconography of geographic locations far from their burial place. Demonstrating associations with powerful foreign cities was likely a leadership strategy of the ruling Maya elite. Radiogenic strontium data have shown that ancient people were far more mobile on the ancient landscape than once thought. This expectation addresses whether those interred in ancestral locations, eastern structures, at mid-level sites were more likely to have been local or non-local by birth.

Initial studies of people residing outside city centers implied that they were passive consumers of urban culture, were socially and ethnically homogenous, and lacked specialized knowledge or innovation (Redfield 1941; see discussion in Robin 2012a:2-3). Urban settlements were seen as the producers of culture and knowledge. Archaeologists studying ancient Mesoamerica confront the model "closed corporate community" for ancient commoners and find it does not fit the data (Lohse and Valdez 2004; Gonlin and Lohse 2007; Robin 2000; 2012; Schwartz and Falconer 1994). In addition, studies of population movement among the Maya from the Colonial era through the 18th and 19th centuries show that they were not only mobile but used mobility as a socioeconomic strategy (Farriss 1984; Robinson 1981; Wainwright 2009; Wilk1991). More recent analyses of archaeological remains using biogeochemical data further support the conclusion that paleomobility among common people was prevalent in ancient times (Freiwald 2011; White et al. 2004).

Two types of data contribute to our understanding of commoner movement over the ancient landscape and I present these starting in more recent time and tracing residential mobility back into the Classic period. First, documents from the Colonial era show that the Spanish Colonial government and the Catholic Church complained about the extent to which the Maya moved across the landscape as it thwarted their efforts at colonization. This lends further support to the idea that the ancient Maya were more mobile than some may expect. Second, movement of the elite in ancient times is document in inscriptions and iconography. Visiting, and even residing in, neighboring cities was like a political strategy for the ruling elite. Material culture found in royal tombs also associates rulers with far off places, suggesting that foreigness may have lent credibility and legitimacy to ancient Maya kings. The relationship between foreigness and local power may also have been a leadership legitimization strategy employed by mid-level leaders. It is important to acknowledge that population movement in the Colonial period was greatly influenced by the Spanish colonizers. It is useful in that it suggests that Maya society had a flexibility that allowed people to adapt to colonization this way.

The Spanish civil and religious authorities were vexed by the extent that indigenous people moved about in the Colonial period. First, movement made it difficult to keep track of taxes and tribute owed and, second, movement made it difficult for priests to evangelize the Maya to Christianity (Farriss 1984:214). During the Colonial period, the Yucatecan Maya moved about in two ways: drift and dispersal (Farris 1984). In an analysis of four 18th century Yucatecan parishes Robinson (1981:158) found that immigration ranged from 22.1-76.6 percent of the total population. Farriss (1984:201,

citing Robinson 1981:158) observes that internal migration was higher in Yucatán than in the rest of colonial Mexico but finds little pattern to the migration. That is, Maya people seemed to 'drift' to other communities after periods of famine or epidemic with little preference for the presence of kin or neighbors. The motivation for drifting away from one's birthplace is unclear (Farriss 1984:200) because almost all communities were under the same economic and social stress in the form of *encomiendas* and tribute obligations to the Spanish. Moving from one community to another severed kin and neighbor ties but did not necessarily improve ones life, although migration helped avoid debt payment. Interestingly, migrants ended up both in major urban centers, like Merida, and in peripheral settlements in equal proportions (Farriss 1984:202). Town and hamlet borders were permeable and migrants were welcomed as people who could help pay tribute and work the land rather than shunned as outsiders (Farriss 1984:205, 222). In sum, incentives for migration are unclear since people did not consistently choose new residential locations that would have improved their life.

Patterns of population dispersal in the colonial era are more easily recognized, as dispersed settlement is tied in to agricultural practices (Farriss 1984:209). Slash-and-burn agriculture is most efficient when fields are rotated regularly which often requires clearing forest for farming. Thus, new families could gradually disperse into the forest past town borders to open more forest for farming. Movement occurred to avoid paying land rent and taxes and to open new land for farming (Wainwright 2009:444; Wilk 1991:64-65). Wilk (1991:64) and Farriss (1984:209) agree that migration may have been a social strategy based on land availability more than anything else.

A similar pattern of dispersal is seen in documents dating to the 19th century from the Toledo district of southern Belize where the British Empire was still attempting to effectively colonize Maya communities. Again, the Catholic Church and British colonial state wanted the Maya to congregate in towns. One strategy for bringing Maya villages into British oversight was to make their land the property of the state and to place all indigenous people on Indian Reservations (Wainwright 2009:438). The Maya would then have to pay taxes and rent on the land they farmed and be forced to settle in permanent villages. The priests and the state saw settled village life as the mark of civilization and associated living in the forest with immorality (Farriss 1991:214). Catholic priests, in particular, complained about how mobile the Maya and thus difficult to educate in church dogma and civilized behavior were. Observations by British Colonial agents reveal that a Maya village was not a, " . . . fixed and permanent settlement, but rather a node of activity within a complex landscape where Maya households prioritized mobility and livelihood security" (Wainwright 2009:443). These examples show that the Maya did not recognize boundaries in the same way as the Western colonizers.

A high level of residential mobility persisted into the post-Colonial era. Incentive to move came from lack of land availability and civil war in Guatemala and Mexico, in particular (Wainwright 2009; Wilk 1991; Farriss 1982). In the late 1970's, Wilk (1991:65) found that Kekchi adults from the village of Aguacate migrated every 9.7 years and the most highly mobile moved every 5 years. In fact, the population of Kekchi villages expanded or contracted almost yearly. Wilk's data on Kekchi residential histories show that degree of mobility fluctuates according to life stage. A newly married couple finds support living with the parents of either the bride or the groom. When a married

couple's children become productive members of the household they have the choice of establishing themselves in a new village or starting their own settlement. The marriages of their children further integrate them into the community or set the stage for families to move into more successful villages. Wilk (1991:223) emphasizes that people who migrate into a community are initially not treated as locals. They must integrate themselves through kinship into the community to gain political power and community responsibility. Mobility is less appealing the further enmeshed a family is in a community.

Mobility among the Maya in fact has a deep history. Archaeologists in the Belize Valley have directly addressed the idea that small and mid-sized communities were insular (Connell 2000; Robin 2012b:322), and found that in fact they usually had ties beyond their local village. During the late Late Classic period, a dramatic population increase occurred in the Belize Valley. This increase was seen at the Chan site where the number of occupied mound groups nearly doubled (Robin 2012b: 322). Importantly, farmers seemed to be leaving one local large site, Buenavista del Cayo, for the recently established Xunantunich. Many farmers chose to settle at the smaller Chan community and were not drawn to settle near the larger, thriving site of Xunantunich. Chan settlement data show active choices made by the Belize Valley farmers and has implications for the control that royal elites had over the commoner population. As it was in the colonial era and more recently, mobility was likely a social and political strategy for ancient Maya commoners to which higher ranked non-commoners had to adapt (Robin 2012b). Outside the Maya area residential mobility was prevalent as well, although migration patterns differed slightlyWhite and colleagues (2004), working in

Teotihuacan, find that 80% of individuals sampled from the city's Oaxaca barrio were born elsewhere or travelled back to their ethnic homeland at least once in their lives. The foreign locations indicated by oxygen isotopes include various Zapotec communities in Oaxaca. Burials within the major temples at Teotihuacan contained individuals from as far away as the Maya lowlands, suggesting contact and movement between distant places. Further excavation of other apartment compounds at Teotihuacan should show whether movement was the norm for locally born Teotihuacanos.

The model for ancient Maya sociopolitical organization also supports the premise that the ancient Maya were mobile. The model of segmentary states relies heavily on the idea of lineages splitting to create rival factions (Southall 1957, 1988). The mobility observed by the Spanish chroniclers, as well as by archaeologists, may be the result of the splitting of lineages into smaller groups. As described in Chapter 5, the growth of lineages relied on this splitting as lineage held lands were carved up to accommodate more families.

In sum, Maya people were not only mobile in ancient and modern times, but their residential histories can be expected to be complex (see also Smith 2014). Through time, they changed residence in response to social and economic pressures. Flexibility in social structure, particularly the model of segmentary lineages, allowed mobility made these communities resilient and dynamic. Ethnographic data suggests that duration of residential history is linked to community power and increased responsibility (Wilk 1991). Recent data from Freiwald (2011) shows that the individuals expected to be local, those interred in ancestral shrines, are not always locally born. How did this propensity for mobility affect non-elite leadership strategies expressed ideologically? Were leaders

themselves mobile or were they an anchor to a particular place for a constantly fluctuating populace? Iconographic representations of Maya kings as well as hieroglyphic inscriptions indicate not only residential mobility among Maya rulers, but also the propensity for leaders to associate with foreign emblems of power and rulership.

Economic and political interaction between Maya cities is well documented epigraphically and archaeologically through architecture and material culture (Marcus 1992; Schele and Mathews 1991). In some cases, Maya kings emphasized the residential history of their predecessors. For example, an Early Classic king at the site of Copán, Honduras, Yax K'uk' Mo', shows ties to Tikál, Teotihuacan, and Caracol. (Bell et al. 2004; Buikstra et al. 2004; Price et al. 2010). Architecture and material culture dating to the era of Yax K'uk' Mo', including the building in which he was buried and artifacts in his tomb, are in the style of Teotihuacan (Bell et al. 2004:132; Martin and Grube 2000: 193; Reents-Budet et al. 2004:169-174; Sedat and Lopez 2004:91-92). Burial 95-1 from the Copán acropolis, dating to the reign of Ruler 2, was interred wearing shell "goggles" and darts with obsidian points seen in depictions of Teotihuacan warriors (Bell et al. 2004:143-144). Radiogenic strontium isotope analysis of the individual most likely to have been Yax K'uk' Mo' show that he was in fact born in the vicinity of Caracol, located in central Belize, spent time as a young adult in the Tikál region, and then travelled to Copán where he reigned for approximately 11 years (Buikstra et al. 2004:208-211; Martin and Grube 2000: 193; Price et al. 2010:30-31). Epigraphic inscriptions referring to Yax K'uk Mo' s birthplace suggest Caracol (Stuart 2007). Evidence for direct interaction with Teotihuacan is lacking at Copán (Sharer 2004:299-300), Teotihuacan style vessels were found in three tombs in the Copán acropolis that

date to the reign of Yax K'uk Mo' and his son, only four vessels total were shown to originate in Central Mexico (Reents-Budet et al. 2004:173-174). Yax K'uk' Mo's predecessors emphasized his connections to Teotihuacan, whatever the nature of those connections were. Ruler 2, his son and successor, constructed a series of temples over Yax K'uk Mo's tomb displaying both Maya and Central Mexican iconography to emphasize the resting place of the founder (Taube 2004:293-294; Traxler 2001:65-66). Late Classic depictions of Yax K'uk' Mo' in stone and ceramics show him in Teotihuacan style "goggles" and holding a flaming dart, a weapon associated with Teotihuacan (Martin and Grube 2000:193; 202; Taube 2004:286, 288).

Hieroglyphic inscriptions recount both short and long term travels between regions. Panel 2 at Piedras Negras shows the young nobles of Yaxchilan, Bonampak, and Lacanha kneeling before the king of Piedras Negras and his young son. The youths participated in a ritual probably as a demonstration of their allegiance (Martin and Grube 2000:144; Schele and Mathews 1991:230-231). According to the hieroglyphs, kings attended rites of accession at other cities, presumably those of their allies (Schele and Mathews 1991:233-234). Permanent change of residence was also recorded, with younger sons traveling to other cities to establish their own dynasties and daughters entering marriages to gain an allegiance for their patriline (Josserand 2002:139-143; Mathews and Willey 1991:55-56). The first king at Dos Pilas, Ruler 1, includes the Tikál emblem glyph in his name suggesting he was a member of that ruling family (Mathews and Willey 1991:55). Women were a key aspect of political strategy in that marriage established alliances that could be drawn upon for financial, social, or military support Josserand 2002:119; Schele and Mathews 1991:243-244). Ruler 1 of Dos Pilas married a

woman from the site of Itzan to establish his precedence in the region. A woman from Dos Pilas, likely Ruler 1's daughter, married into the Naranjo dynasty in the Late Classic period (Martin and Grube 2008; Mathews and Willey 1991:62).

It seems to have been more common for local Maya kings to emphasize ties to foreign cities using material culture. At the Central Lowland city of Tikál, carved stone monuments (stelae) depict Yax Nuun Ayiin as a warrior of Central Mexico and Spearthrower Owl, his father, is indicated by a name glyph consistent with Teotihucan iconography (Wright 2005, Stuart 2000). If Yax Nuun Ayiin's father was from Teotihuacan, scholars think it more likely that his son was born in Teotihuacan and brought to the Maya era to begin a dynasty. Strontium isotopes show that, in fact, Yax Nuun Ayiin was born and raised within the Tikál region (Wright 2005). It seems that foreignness, specifically Central Mexican relations, was emphasized by Tikál kings to legitimate their rule.

Architecture and material culture evoking Teotihuacan is also found at Kaminaljuyu, an ancient Maya city located in the southern highlands of Guatemala, (Wright et al. 2010). Kaminaljuyu was a powerful city in the Preclassic period, but entered a dark age when the nearby Lake Miraflores, their source of drinking and irrigation water, dried up. A second fluorescence occurred in association with the appearance of Teotihuacan architecture and material culture (Wright et al. 2010:157). As elsewhere, the nature of the relationship between Kaminaljuyu and Teotihuacan is unclear, although strontium isotopes have been used to test hypotheses of colonization vs. indirect economic impact. Biogeochemical analyses show that the principle occupants of royal tombs dating to this period of florescence are all local individuals.

At the site of Punta de Chimino, Wright and Bachand (2009) discuss a burial with both Maya and central Mexican mortuary traits. The individual was interred in a round cyst, an uncommon Maya grave style, with pots that were central Mexican in origin. Strontium isotope data shows the occupant was raised in Northern Maya Lowlands in the vicinity of Tikál. In this case, as the preceding ones, the material culture is not correlated with the birth origin of the grave occupant.

Material culture consistent with the Yucatecan city of Chichen Itza provides evidence for interaction in the Postclassic period, after the collapse of many of the western Maya cities, between eastern Belizean sites and unspecified Yucatecan sites (Fox et al. 1996:815; McAnany et al. 2004:301). While there is no strontium isotopic data to support human mobility between eastern Belize and Yucatecan sites, there are data from the site of Mayapan (Wright 2007) showing movement between the western and central Maya lowlands and the Yucatán during the Postclassic period.

Maya royals moved extensively across the ancient landscape to create and maintain political ties. Some also chose to emphasize an association with politically strong foreign cities like Teotihuacan. How engrained were these leadership strategies in Maya culture? These patterns provide a starting point for exploring the way that leaders related to their communities and for investigating the characteristics that were valued in leaders during life so as to better understand how they were treated after death. The ruling elite clearly exercised a great deal of mobility and ethnographic and ethnohistoric data attest that mobility was common throughout society. Was the same degree of mobility found among commoner populations and their lower-level community leaders or was residential mobility uncommon for this part of society?

Expectation 2: Mortuary Ritual

Expectation 2 states that mid-level leaders in the Belize River Valley entered into relationships with their ancestors through interaction with ancestral skeletal remains. Maya worldview prioritizes the creation and maintenance of relationships between human and non-human beings. These relationships must be materialized with appropriate physical objects and, I argue, human bone was one object that was deemed useful for communicating with and venerating deceased ancestors.

Ancient Maya burial practices have been a focus of study since the earliest excavations in the Maya area and there have been several syntheses of these data (Ricketson 1925; Ruz 1968; Rathje 1970; Robin 1989; Welsh 1988a; see also Saul 1972 and Whittington and Reed 1997 for bioarchaeological approaches). Given that the ancient Maya did not isolate the deceased in cemeteries, archaeologists encounter burials somewhat randomly and burial practices vary a great deal across space and through time (Coe 1959:120; Krejci and Culbert 1995; Ricketson 1925:328; Robin and Hammond 1991; Ruz 1968:164-167; McAnany et al. 1999; Welsh 1988a, 25-26). Due to this variability, no standardized burial definition or grave typology is available for the Maya area, though A.L. Smith's (1949, 1972) grave typology and burial definition are frequently used and modified by scholars to suit their data (Chase 1994:124; Coe 1959: 120; Welsh 1988a:7-19). Smith's (1950:88, 1972:212) definition of a burial is all objects associated with an interment including the grave, human remains, and associated objects. Grave types are simple pits, *chultuns*, cists, crypts, tombs, and unknown. Welsh (1988a:16-18) expanded each of Smith's grave types to include several varieties. For example, a crypt is a grave with walls partly or completely lined with stone that are

always caped by stone slabs. Crypts can be simple or elaborate depending on the placement and quality of the stones (cut and faced vs. unshaped), presence of other features such as niches or an antechamber, presence and amount of plaster on the walls or floor, and height of the construction (Welsh 1988a:18).

Interments are recovered in various positions, extended prone or supine, flexed on the left or right side, and occasionally seated (Welsh 1988a:37; Pereira 2013). Orientation of the head varies by site and, at some sites, by location of the grave (Welsh 1988a:55). Directionality is an important aspect of modern and ancient Maya ritual (Ashmore and Geller 2005; Coe 1975; Coggins 1988; Freidel et al. 1993; Knab 2004), and possibly ancient Maya civic planning (Ashmore and Sabloff 2002), though there are only very broad regional patterns according to grave orientation (Welsh 1988). Grave goods are found with many but not all burials and include ceramic bowls, plates, or dishes, shell, jade, figurines, animal bone or teeth, and lithics (Welsh 1998a:102). Wealthier burials contained codices, stingray spines, masks, textiles, and animal pelts (Welsh 1988a:102). Burials most often contain a single, primary interment, but collective burials containing only primary, or a combination of primary and secondary remains, are often encountered (Welsh 1988a:36). Multiple individual burials containing primary interments, according to Welsh (1988a:37), consist of adults buried with one or more juveniles or a primary individual interred with several secondary burials. Juveniles are frequently a part of collective burials (McAnany and Storey 2006).

Human remains are most commonly found beneath the floors and walls of residences, though they are also recovered in public locations such as ceremonial platforms and plazas (McAnany 2013[1995]; McAnany et al. 1999; Storey 2004; Tozzer

1941; Welsh 1988a). Ancient Maya residential units consisted of several (3+) structures surrounding an open patio in which resided members of an extended family (Chase and Chase 1998; Haviland 1988; Leventhal 1983; McAnany 2013[1995], 1998; Sharer and Traxler 2006:692-693). Interments tended to occur during phases of remodeling, in both elite and non-elite contexts, emphasizing the parallel of the human life cycle with regeneration and rebirth (Carlsen and Prechtel 1991; Chase and Chase 2004; Haviland 1988; McAnany 2013[1995], 1998). McAnany (1995:161, 1998:273) argues that the interment of deceased relatives within the residence establishes and maintains the primacy of the lineage residing there and, thus, access to agricultural and other resources. Important individuals were selected after death for interment in ancestor shrines. Becker (1971) identified pyramidal platforms, often located on the east side of residential groups at the site of Tikál, as possible ancestor shrines or *oratorios* (Tozzer 1941:129). Similar structures have been identified at other sites in the Maya lowlands, though their location tends to vary more than originally thought (McAnany 2013[1995]:53). Physically establishing a 'genealogy of place' through burial of distinguished ancestors in ancestor shrines is one possible way to maintain the descendant's right to access agricultural landholdings and other material possessions of their antecedents (Gillespie 2000a; 2001; 2002:70; Goldstein 1981; McAnany 2013[1995]:65; Morris 1991; Saxe 1970; Sharer and Traxler 2006:693).

Archaeological data shows that the Belize Valley was linked economically and politically to the greater Maya world, though mortuary data suggest residents maintained some degree of autonomy in their mortuary ritual (Garber et al. 2004a, 2004b; Leventhal and Ashmore 2004). Archaeologists have long recognized that mortuary ritual takes on a

specific form at Belize Valley sites (Awe 1992; Schwake 2008; Freiwald 2011). Burials were most often interred with their heads oriented to the south and laid in a supine position, a position not common elsewhere in the Maya world (Freiwald 2011; Welsh 1988a:218, 255-264; Willey et al. 1965). At the site of San José, located immediately northeast of the Belize River Valley the burial pattern changes. Burials are consistently placed in a flexed position on either the left or right side (Thompson 1939). It seems clear that body positioning was a distinguishing factor for ancient Maya groups in Belize.

The practice of post-interment veneration includes offerings of food, beverages, and sacrificial blood of humans or animals (Tozzer 1941:131). Iconographic and textual evidence indicate that ingesting tobacco, *balche* (a slightly alcoholic beverage), along with bloodletting, aided in communication with the deceased (McAnany 2013[1995]:34-35; Schele and Freidel 1990:69; Schele and Miller 1986). Among the modern Maya, burials are reentered and a select few were also exhumed and their bones cleaned, fed, and cared for (Aguilera 2004, 2009, 2010a; Gillespie 2002; McAnany 1998; Redfield and Villa Rojas 1962; Vogt 1969). Landa (Tozzer 1941:131) describes how only parts of the bodies of high-ranking individuals were buried while the rest was cremated and ashes placed within a wooden figurine. Fragments of skin saved from cremation were fastened to the figurine. The crania of some lords were removed from the grave, cleaned of flesh, and their faces reconstructed with bitumen to resemble the deceased (Tozzer 1941:131). Stone stelae, altars, and monumental architecture record re-entrance into tombs to collect skeletal remains, conduct ritual involving smoke and divination by the ancient Maya elite (Chase and Chase 1994,1996:77; Fitzsimmons 1998:271, 2002; Freidel et al. 1993: 278-279; Harrison 1999:133-139; McAnany 1998:281-291; Stuart 1998:398; Tielser

2000:145). McAnany (1995:62, 127) found similar evidence for post-interment reentry into an ancestor shrine at the farming community of K'axob, suggesting that ancient Maya relational worldview and resultant death rituals cross-cut all social groups.

Epigraphic and archaeological evidence suggests that these rituals were done at specified times following a person's death (McAnany 1998:289-290; Eberl 1999). Eberl (1999) has reconstructed a three-part burial sequence beginning with the *muhk-aj*, or initial burial event, occurring about ten days after death. According to Tiesler (2000:145), the subsequent 100 to 400 days was the time in which the final resting place for the deceased was prepared and was formally "consecrated" through smoke ceremonies. McAnany (1998:289) describes this final interment event as the *muknal*, identified by a hieroglyph of a skull surrounded by a platform-like structure. Inscriptions from nine sites have corresponding *muknal* and death dates. The time passing between death and recorded *muknal* events varies from 260 days (9 months) to 8884 days (24 years). Eberl (1999) mentions several inscriptions referring to the deceased many years after death. These are infrequent and reference smoke ceremonies and collection and bundling of skeletal elements (Tiesler 2000:145). All the *muknal* glyphs come from sites in the same region near the Usumacinta River. These findings indicate possible regional differences in ancestor veneration (see Ashmore and Geller 2005; Fitzsimmons 2009:112-117).

While the Maya mortuary behaviors are long recognized as complex, only recently have forensic methods been used to investigate this phenomenon. Tiesler's study (2007) of a skeleton from the site of Becan, Campeche, Mexico, illustrates how bioarchaeologists reconstruct extended mortuary rituals. The semi-complete and semi-

articulated body of a young adult, probably male, was found within a passageway at the base of a staircase outside the entrance to a chamber beneath a large temple. The seemingly haphazard placement of the individual at the base of the stairs could have indicated a rushed or opportunistic disposal of a body. Meticulous examination of the skeletal remains and their architectural and cultural contexts revealed a more complex mortuary process. The body had been laid upon a bed of chert flakes, a treatment seen in some royal burials in the Maya area (Fitzsimmons 2009). The feet remained in articulation, indicating that the body decomposed in situ. However, the long bones and skull were not recovered with the rest of the body. These are some of the most robust bones in the body and the most plausible explanation for their absence is that the passage was re-entered and the bones removed after decomposition. Cut marks, made to fresh bone, were observed on several ribs and vertebrae. The pattern of cut marks was interpreted as indicating heart extraction, a ritual associated with human sacrifice among the ancient Maya. Tiesler thus interpreted this deposit as a sacrificial victim, whose remains were revisited later in time, importantly revealing that practices usually thought to be reserved for elite ancestors, like re-visitation, occurred in other instances as well.

Evidence for extended mortuary rituals for a series of deceased persons, contrasting with that for a single individual, has also been recovered. Tiesler and colleagues (2010) drew on taphonomic, forensic, and archaeological evidence to interpret a complex, multiple individual funerary deposit from the Late Classic period Maya site of Xuenkal, Yucatán, Mexico. At Xuenkal, four graves, three cists, and one crypt were encountered within a long, low platform of residential function. A single grave enclosure surrounded the three cists (Tiesler et al. 2010:366). Careful field excavation included

precise plotting of spatial locations for each skeletal element within the graves as well as data on the depth, orientation, degree of skeletal articulation, and taphonomic conditions of each element. Each grave context contained at least two individuals–a primary interment and a deposit of disturbed or incomplete skeletons that were secondary interments or remnants of primary burials from which elements had been taken. Minimally, eighteen individuals were recovered from this deposit. Interestingly, the bodies placed in this grave context showed a variety of postmortem treatments identified with the aid of carefully collected taphonomic data. Several individuals were left in open spaces to decompose, while the graves of others were filled before decomposition. The bones of at least two young adults were moved within the grave space; in both cases, lower extremities found at one end of the grave matched the osteological maturity of the upper part of the skeleton found at a different stratigraphic level. A tooth found with one set of postcranial remains confirmed that these remains belonged to those of a skull that was found in a plate associated with another individual (Tiesler et al. 2010:370). Individuals of both sexes and all ages were represented in the deposit, although most were men. Individuals were placed in the space continually for decades, if not centuries. Tiesler and her colleagues suggest that the extended mortuary treatments and the duration of time over which the grave space was used indicate that the memory of the deceased through ancestor veneration practices was likely the cultural motivation for the creation of this deposit. While these practices are recognized elsewhere in the Maya area, the deposit at Xuenkal was the first example of this type of practice in the Northern Yucatán (Tiesler et al. 2010:377).

Saul and Saul (2002) combined forensic and archaeological data to investigate the sequence of deposition of a multiple-individual deposit in the Maya Mountains of Belize. As discussed above, burial practices of the ancient Maya are notoriously complex and variable. Sacrifice and dismemberment were practiced and unusual body placement or position is sometimes cited as evidence of a sacrificial victim (Welsh 1988). The interment analyzed by Saul and Saul (2002) consisted of three burials – a male, a female, and an infant – within the same rock shelter. The male and female were articulated and apparently primary. The remains of the infant were found scattered around the grave. The authors used osteological data to address whether the infant was dismembered or decapitated before burial (Saul and Saul 2002:75). The authors observed that the first and second cervical vertebrae were in a position that would have been impossible in a fleshed body. Furthermore, the left radius and ulna, bones of the forearm, were found in close proximity but in an incorrect anatomical position, with the distal end of one bone pointing north and the distal end of the other bones pointing south – also impossible in a fleshed body (Saul and Saul 2002:75). The authors concluded that the infant was already significantly decomposed when placed in the rock shelter. Based on stratigraphic associations, their reconstruction of events proposes that the juvenile died first and was interred elsewhere. The male died next and the juvenile was brought from its initial grave and placed with the man. The woman was the last to be interred in this location, over the remains of the man and the juvenile. Saul and Saul suggested that the three were members of the same family who died close in time and thus were buried together. Although, preservation of bone in tropical environments is typically poor, clearly knowledge can be gained from careful analysis of grave contexts.

Maya worldviews emphasize the creation and maintenance of relationships between all beings, living and dead particularly the power associated with maintaining relationships with the life essences of deceased spirits. Maya cosmology shows that human bone held particular significance for rituals concerning regeneration and renewal. Ancient Maya archaeological and epigraphic evidence indicate that rituals occurred at and within graves or tombs and that these rituals sometimes concerned the exhumation of a body or the curation of certain elements, such as long bones or skulls. While these practices are recognized widely (Astor-Aguilera 2010; McAnany 2013[1995]; Chase 1994; Fitzsimmons 2009; Fitzsimmons and Shimada 2011; Weiss-Krejci 2001, 2003) they are only recently beginning to be systematically studied.

The number of bioarchaeologists incorporating taphonomic and forensic science principles into their analytical approach has steadily increased in recent years. Case studies have effectively used the field anthropology method to enhance knowledge of mortuary behavior and its variation across cultures, particularly treatment of individual bodies. The method has been applied productively in Mesoamerican and Maya contexts. Analysis of grave space, container, and body position in various contexts speaks to the process of ancestor creation and veneration, and the role of the human body in these practices.

The ancient Maya buried multiple individuals in a common grave, a practice observed in some ancestral structures. Collective interments can be either simultaneous or sequential and can contain primary burials, secondary burials, or both (Duday 2006, 2011; Tiesler et al. 2010). In addition, the archaeological record shows that bones were

extracted from grave contexts after decomposition, possibly for use as relics or for display, and they were added to grave contexts in the form of secondary burials. The model of sociopolitical organization given in Chapter 5 proposes that ancestor veneration rituals were an important, integrating factor for ancient Maya lineages. Structures dedicated to deceased lineage leaders are a key material element of this model. The bodies of the deceased were likely important subjects of veneration in the form of exhumation of certain elements for display or curation, for instance. Ethnohistoric data (Carmack 1981) suggest that when a schism occurred lineage leaders carried bundles containing ritual objects, possibly including human skeletal remains, as they migrated to their new home. Thus, empty graves or primary burials with only a few elements missing may be indicative of this migratory behavior.

Caches have also been recovered that consist of particular body parts. For instance, caches of hand phalanges and teeth are found at sites throughout the Maya lowalnds (Welsh 1988). Finger caches, in particular, have been recovered at sites in the Belize Valley (Audet 2006; Cheetham et al. 1994). Understanding the depositional history of these contexts, as well as the cultural motivation behind them, has important implications for local perceptions of ancestors as individuals or as representatives of a community, thus addressing directly the second expectation of this research design, that mid-level leaders in the Belize River Valley entered into relationships with their ancestors through interaction with ancestral skeletal remains.

Expectation 3: Biological Lineage and Kinship

Expectation 3 states that individuals interred in eastern shrines were lineage members. A lineage is a biological descent group and ancient Maya society and residence was likely structured by one's lineage. Epigraphic and iconographic data suggest that Maya royalty relied on genealogical depth for legitimization. In many cultures, including the ancient Maya culture, interment of lineage members in particular locations creates claim to land and resources for descendants. Mid-level sites with eastern structures containing burials interred over several centuries suggest that lineage may have been emphasized as a leadership strategy by them, as well.

Contemporary and colonial-era Maya generally define group membership based on lineal descent and co-residence, although in practice the rules of descent and co-residence are maleable (Fox 1967; Gillespie 2000a; Murdock 1949; Watanabe 2004; Nutini 1976; Restall 1997; Vogt 1969; Redfield and Villa Rojas 1962; Carmack 1981; Farriss 1992; Guiteras Holmes 1954; Wilk 1988; Wisdom 1940). Iconographic data indicate that ancient Maya royalty emphasized genealogical depth through ancestral ties to enhance and maintain social power (Sharer and Traxler 2006; McAnany 2013[1995]). Scholars argue that ancestor veneration was a cultural institution that originated with commoners; however, there is no archaeological evidence that commoners communicated their genealogies through hieroglyphic or iconographic inscriptions (Freidel and Schele 1988; McAnany, Storey, and Lockard 1999). McAnany (2013[1995]:53, 96-110). suggests that commoners marked their genealogies through other materials, namely by interring relatives within their homes and residential shrines. I use biological data to test whether individuals interred in these shrines were biologically related to each other,

whether biological relatedness was an aspect of a person during life that predicated burial location and body treatment.

Cross-culturally, as Kuper (1982:72) summarizes, the two most common factors determining membership in a social group are blood and soil - either an individual's biological relatedness to a group or the fact that they share a common residence with the group will determine if they are considered a legitimate member. Lineages are defined as consanguineal kin groups produced by unilineal descent, either through a matriline or patriline, the members of which can trace their genealogical descent through known relatives (Fox 1967:49; Murdock 1949:46). The function of a lineage is to define for its members their rights and social duties to other members (Fortes 1953:165). Murdock describes the 'compromise' group as one for which the unilineal descent of the group is at least as important for group cohesion and integration as residence (Murdock 1949:66), a description that Gillespie (2000a,c) proposes fits well with the Maya data.

Contemporary Yucatec Maya seem to be organized predominantly by patrilineal descent, although matrilineal descent is also acknowledged (Redfield and Villa Rojas 1962:92). As recent as the 1950's, ethnographers recorded Maya groups in Chiapas, Mexico that reported bilateral descent (Guiteras-Holmes 1954:69-70). Today, a married woman's family participates in ceremonies and family decisions, however it is the relationship with male members of a family that are emphasized such that the man is the head of the family, children take the father's name, and unmarried or widowed women live with brothers and sons rather than their own family (Farriss 1984:135; Redfield and Villa-Rojas 1962:92). Among the Quiche, leaders are referred to as "mother-fathers", which emphasizes the power of both male and female lines (Carmack 1981; Tedlock

1996; McAnany 2013[1995]). Both lines of descent are recognized in other Mesoamerican cultures as well. Among the Nuyooteco of southern Oaxaca the bride retains duties and responsibilities towards her natal home after marriage, which is seen as a social and economic advantage to both families (Monaghan 1996:182,188).

The core of contemporary Maya social organization is the nuclear family, through which children were educated and a family's daily subsistence is procured (Farriss 1984:132; Redfield and Villa-Rojas 1962:89; Restall 1997:13; Wilk 1988:139, 142; 1991:205). Most nuclear families reside on a house lot with members of their extended family living in adjacent houses within the lot (Vogt 1969; Wauchope 1938). The extended family residence consists primarily of patrilineally related males, their wives and children, and possibly elderly relatives of either parent (Redfield and Villa Rojas 1962:89; Vogt 1969). Residing with extended family had important economic functions. Most farmland is owned by a patrilineal group and thus the men, whose job it was to farm the *milpa*, would work together to do so (Wilk 1991). Eventually, the extended family groups grow large and segment, with brothers or sons leaving to start their own independent household (Fox et al. 1996; Wilk 1991:210; Vogt 1969).

However, residence rules are not strictly enforced for many contemporary Maya groups. Wilk (1988:140) emphasizes that there is actually no explicit documentation of patrilocal postmarital residence rules for the contemporary Maya, in fact the only consistent behavior in this regard among the K'ekchi of southern Belize is bride service. A young married couple resides with the bride's family for a specific period of time after which some, but not all, couples established neolocal independent households or moved

to the house lot of another relative. Post-marital residence is often economic or a matter of personal preference (Wilk 1988).

Ancestors are an important component of Maya daily life and social organization. An ancestor is defined anthropologically as "a named, dead forebear who has living descendants of a designated genealogical class representing his continued structural relevance" (Fortes 1987:68). As described above, Maya worldviews emphasize maintaining generational cycles by enabling agricultural renewal, bearing children to propagate one's lineage, and engage in reciprocal relationships with all persons - living and deceased. The deceased, buried within homes, were integrated into the daily life of the living family by virtue of their presence in the home. A select few were placed in shrine structures and venerated as ancestors; McAnany (1995) proposes that interments within residential shrines anchored a lineage to the landscape, marking their home and agricultural fields.

In some Belize Valley cases, eastern structures were not the focus of interment, although the body treatment may be seen as ancestral. Deposits of one or multiple human inhumations are found under plaza floors beneath altars, as well as intrusively into round structures that date to the Late Preclassic period (Aimers et al. 2000). With the available data, it may be possible to compare architectural contexts to test the model of eastern structures as representative of a biological lineage.

Colonial-era documents describe similar descent and co-residential behavior for the Maya. Roys (1957:2) recounts for Yucatecan Maya peoples that "Every person had a patronymic, and the bearers of the same patronymic constituted a recognized group. This was called a *chi'bal* . . . And the Maya thought of it and called it a lineage." Restall

(1997) emphasizes residence and biological relatedness to a *cah* as the most important factor in Maya personal identity during colonial times. *Cah* indicates one's literal place of residency as well as the social identity of membership in a social group. The word is used in wills to describe one as a "homeowner" and testators gave the name of one's parent's *cah* as a personal identifier (Restall 1997:16). *Cah* can by used as the verb "to be" and to describe the sentiment of "I am here"; there was clearly an ethnic and geographical identity associated with being the member of a *cah.*

Geographically, the *cah* was a house lot within which relatives of the same patronym, or *chibal*, also resided. Documents show several different patronyms present in each *cah*. The *chibalob* were described by Restall (1997:17) as "a kind of extended family" each of which acts to make marriage alliances with other *chibalob*, keep farmlands in the family, and possibly create political factions (see also Farriss 1984:133). At a regional level, during colonial times there existed a hierarchy of lineages that institutionalized differences in wealth and power (McAnany 2013[1995]:23).

Ancient material culture correlate with aspects of Maya social organization described above. For instance, throughout the Maya area residential structures are grouped in a way similar to that described in colonial times. Residences are typically grouped around an open patio and the group expands over time through additions to existing structures or establishment of new buildings. Archaeologists interpret these groups as the homes of an extended family group consisting of a parental unit and their children with their spouses and children (Ashmore 1981; Haviland 1963, 1988; Watanabe 2004; Wilk 1988:142-143). Haviland (1988:126-131) uses this model of settlement to reconstruct the expansion of a family residential group over several generations,

including the death and burial of the first occupants in one of the houses. The question remains, how did lineage and residence serve to integrate these Maya settlements?

Historically, intense debate among anthropological archaeologists surrounds how kinship and residence served to integrate ancient Maya society (Gillespie 2000a,b,c:470; Watanabe 2004). As in many cultures, social ideals are well known but people typically behave in a way that meets their current socioeconomic or political circumstances (Redfield and Villa Rojas 1962:87; Wilk 1991). As describe above, residence and kinship both regulate social group membership for the Maya, but to date no type of social organization alone accurately describes how these factors work together (see also Watanabe 2004; Schneider 1984). In his analysis of colonial-era Maya social organization Restall (1997:17) states that the *chibalob*, " . . . were closer to exogamous clans than to lineages, bearing similarities to both, although the Maya term more accurately reflects their particular combination of characteristics." If defining a type of social organization for the Maya is the goal, then clearly that goal has not been met as the Maya cannot be classified as two types.

Given these difficulties, Gillespie (2000a, 2000b) eschews a classificatory approach to kinship, which is the traditional anthropological method (see Geertz and Geertz 1975:155-156; Schneider 1984:176-177), and suggests a perspective that therefore focuses, "on the practices and understandings by which relationships are constructed in everyday social life, rather than on abstract or idealized rules" (Gillespie 2000b:1; 2000c:39-41). Gillespie (2000c) suggests Levi-Strauss's 'house' concept better fits the evidence we have for Maya social organization as,

[A] corporate body holding an estate made up of both material and immaterial wealth, which perpetuates itself through the transmission of its name, its goods, and its titles down a real or imaginary line, considered legitimate as long as this continuity can express itself in the language of kinship or of affinity and, most often, of both [Levi-Strauss 1982:174].

Consistent with the Maya ethnographic and ethnohistoric data, Levi-Strauss (1982:180) describes the rules of 'house' membership as being a dialectic between biological affinity and residence. Presumably, one could trump the other, depending on the sociopolitical context of the moment. Gillespie (2000a:476) draws on Bourdieu to reconfigure the idea of kinship as, "the product of strategies (conscious or unconscious) oriented towards the satisfaction of material and symbolic interests and organized by reference to a determinate set of economic and social conditions" (Bourdieu 1977:36). Gillespie's approach fits the reconstruction of Maya worldviews proposed in Chapter 2. The Maya focus on building and maintaining relationships with human and non-human persons. Maintaining these relationships makes one a part of a Maya community; the definition of a non-person is someone who does not participate in village social life (Watanabe 1992; Monaghan 1996, 1998; Fischer 2001). As Bourdieu states (1977), the idea of kinship, or just relatedness, can be leveraged at the necessary time. Particular actions create an identification or feeling of similarity between people of the present and those of the past who were considered ancestral (Gillespie 2000a:474). Feelings of similarity can be emphasized through biological relationships or by shared common experience during life, or co-residence. I argue that the focus of anthropological research

on social organization should focus on the ways in which the ancient Maya maintained their relationships (see Watanabe 2004:165).

This brief discussion of lineage and social organization is important because models of ancient Maya ancestor veneration are rooted in traditional anthropological types of social organization. Different criteria determine who is venerated as an ancestor depending on the type of social organization to which a group adheres. For example, clans refer to generalized ancestors who are held in common by members of the group while groups emphasizing unilineal descent through lineages refer to ancestors known during life, at least for a few generations (Murdock 1949). Social organization defines who is considered an ancestor and the proper ways in which the living interact with ancestors. It has been proposed that biological lineages venerated ancestors to harness ancestral power and to mark their place on the physical landscape (McAnany 2013[1995]); therefore this dissertation tests whether lineage membership was a defining characteristic of interment in eastern structures.

Lineage membership alone is not an accurate way to describe group affiliation and social organization among the ancient or modern Maya (Gillespie 2000a,b,c, 2001; Monaghan 1996; Watanbe 2004). Residence also plays an important role, since according to Maya worldviews one must participate in the group to be considered a full member and even a full person (Fischer 2001; Watanabe 1992; Monaghan 1996, 1998). The most important point is that Maya worldviews are centered on creating and maintaining relationships with certain persons, human or non-human, living or dead. Expectation 3 proposes that lineage membership may have been a way that ancestors were chosen for veneration. I use kinship analyses (Stojanowski and Schillaci 2006) to test whether burial

locations associated with ancestors contained individuals that were more closely related to each other than to people in other locations, suggesting they were members of the same lineage. Expectation 4 addresses if time and social transformation affected the relationship between the living and the dead.

Expectation 4: Social Transformation

Expectation 4 states that the frequency and intensity of ancestor veneration will increase during times of social transformation, when it becomes necessary to confirm and display group identity. This expectation investigates how the social institution of ancestor veneration was manipulated at mid-level sitesgiven sociopolitical transformations. As a practice that is thought to have anchored ancient Maya social organization, from royals to commoners, it is likely that it was manipulated for gain at all levels of society. Given that each social group had access to different schemas and resources (Giddens 1984), we may expect that ancestors were materialized differently betwee social groups and materialization likely changed over time.

No social institution operates in isolation from the rest of society and can be expected to change over time and space. John Watanabe explains that, “we can best define relative, not absolute, social arrangements, because whichever nodes and relations people in a society may privilege, the others always remain in play, lest the underlying social fabric unravel” (Watanabe 2004:165). Using multiple lines of evidence allows scholars to observe each node, for example biological relatedness, and how it relates to other nodes, like mortuary treatment. The present study addresses how the social

institution of ancestor veneration fluctuated over time and space to elucidate the relationships that produced the social fabric.

Iannone (1996; 2003) hypothesized that ancestor veneration rituals of mid-level leaders should be expected to change as large ceremonial centers expand and contract in geographic size and sociopolitical influence (Marcus 1993). Iannone proposes that differences in ritual practices at the site of Cahal Pech are linked to sociopolitical changes in the Belize Valley. He identified prominent ritual displays during times of political contraction of large ceremonial centers, which became less visible during times of political expansion. Intensities of inter- and intra-community interaction may fluctuate within the Belize River Valley, however. Geographic location of mid-level sites communities with respect to ceremonial centers varies and, according to Iannone's model, scope of influence would thus be expected to vary as well (see also Scott 1990). If neighboring communities had different relationships to city-state leaders, the frequency and intensity of ritual displays would have differed under conditions of state expansion. This project will test Iannone's expectation at sites throughout the Belize River Valley by examining variation in ritual practices over time.

More specifically, the project addresses changes in ritual practices with respect to material culture in graves and frequency and type of architectural renovation. In her work on the Aztec, Elizabeth Brumfiel (2004) found that at hinterland sites the types of ceramic vessels used in feasts, and the iconography with which they were decorated, fluctuated depending on how involved the Aztec state was with the settlements. Kosakowsky (2012) found that at the Chan site, located in the Belize Valley, ceramic vessels were used in burials in caches until Early Classic period, after which they are only

found in caches and never in burials. The temporal variability of the co-occurrence of artifacts is also addressed, for instance the co-occurrence of items associated with ancestors like bloodletting implements and red pigments (McAnany 2013[1995]; Krejci and Culbert 1995).

Use of ritual space may also change over time. Burials seem to often be placed within ritual and residential structures during times of renovation or refurbishment (Haviland 1963, 1988; McAnany 2013[1995]; Welsh 1988). Archaeologists hypothesize that the interments and renovations demonstrated continuity of leadership and served as displays of legitimization (McAnany 2013[1995]; Hutson et al. 2004). Hutson and colleagues (2004) argue that some refurbishments could have indicated discontinuities or disputes in succession and functioned to erase or reorient the meaning of group heritage (Hutson et al. 2004:88). For example, the modification of one eastern structure at Chunchucmil, located in the Yucatán peninsula, included the partitioning of a room into public and private space occurred at a time when the focus of activity in the residential group had also shifted. The authors interpret these modifications as "resignification" of the group's ritual heritage (Hutson et al. 2004:88-89). The present study will compare structural modifications as well as changes in grave architecture to broader sociopolitical transformations in the Belize River Valley.

While this dissertation is principally concerned with ancestor veneration, manipulation and interaction with the deceased body is not limited to veneration practices. Times of social transformation, in particular, may result in desicration of grave contexts with the intent of destroying ancestral materials (Duncan 2005; Duncan 2011; Duncan and Schwarz 2014). During the Late Postclassic and Colonial era, when lineages

were moving to new homes they would bring bundles that, ostensibly, contained the bones of their ancestors (Carmack 1981). These treatments of the grave space may look, in the archaeological record, similar to ancestral treatment if data on taphonomy and context are not taken into account (Tiesler 2007, Weiss-Krejci 2001, 2003, 2004).

The flexibility of social and ritual organization among modern and colonial-era Maya allowed them to adapt in the face of fluctuating sociopolitical circumstances. The occupation of several sites in the Belize River Valley for 800-1000 years speaks to a sense of resilience among the ancient Maya as well. Previous research at mid-level sites does suggest that occupants responded differently to state expansion or broader sociopolitical fluctuations (LeCount and Yaeger 2010b). The research presented here addresses changes in mortuary behavior over time, including changes in the frequency and style of architectural refurbishments of eastern structures, to better understand how the institution of ancestor veneration was practiced by mid-level leaders in the Belize River Valley.

Conclusion

This chapter introduced a model for ancient Maya sociopolitical organization. The model states that the Maya civilization consisted of numerous autonomous "peer polities" each ruled by king, a member of a particularly strong lineage. These polities are characterized as weak states whose power expanded and contracted over time. Four hypotheses were then introduced to test various aspects of the model in the interest of addressing the overall research question of how non-elite, mid-level leaders practice the institution of ancestor veneration and how these practices were influenced by broader sociopolitical changes through time.

Among common Maya people, mobility was likely high and residential history potentially complex, especially for aspiring leaders who may have gained political clout for making foreign connections. Residential history was also a component of membership within a local lineage. Previous research on ancient Maya ancestor veneration and social organization often uses the concept of a lineage in a general way, as the Maya evidence for social organization defies categorization in traditional anthropological terms. By definition, an ancestor is an important and influential lineage member and it is expected that, at any point in time, those interred in ancestral shrines will be more phenotypically similar to each other than to individuals in other ancestral shrines. Given the emphasis in Maya worldview of regeneration and renewal through maintaining relationships with human and non-human persons, it is expected that those interred in lineage structures will show more frequent engagement by the living with the skeletal remains than those not interred therein. Overall, it is expected that the emphasis on any one of these aspects of social life that contribute to creating ancestors will change over time. It is reasonable to expect that the concept of an ancestor or ancestors did not stay constant over time or over space.

As Wylie describes (1989:14), it is important for archaeologists to refine their understanding of the 'determining structures' for particular cultural and temporal contexts. Through the hypotheses discussed above, I propose that residential history, lineage, and grave re-entry are important determining structures of the Maya institution of ancestor veneration, as supported by the relevant ethnographic and ethnohistoric data. An archaeological perspective on these parameters provides historical depth and will show if any of these structures changed over time. A distinct strength of bioarchaeology,

and this dissertation, is that multiple lines of evidence can be brought to bear to illuminate how particular parts of ancient Maya society participated in the institution of ancestor veneration, within the relevant structures. In the following chapter, I articulate the above hypotheses with appropriate bioarchaeological analytical methods.

CHAPTER 6: BACKGROUND AND SAMPLE SELECTION

The Belize River Valley provides an excellent location for studying the dynamics of ideology and social complexity among ancient Maya commoners for four reasons – 1) considerable regional time depth, 2) lack of one dominant overlord for much of the valley's history, 3) an archaeological focus on settlement archaeology, and 4) the fact that burial practices are linked to a broader, Belize Valley identity. In the following chapter I contextualize my sample of ancient Maya commoners with the environmental and cultural history of the Belize Valley and briefly describe the sites from which burials were recovered that were useful for this project. I conclude by describing the sample compiled from the over 400 burials excavated to date from the Belize River Valley.

Belize Valley: Geography and Resources

The Belize River Valley is located in west central Belize and is demarcated by the Maya Mountains to the south and the Yalbac hills to the north (Figure 2). The confluence of the Mopan and Macal Rivers creates the Belize River just north of the modern town of San Ignacio. Ancient Maya settlements are dense along both banks of the river from the upper Belize Valley through the central parts of the valley. The upper Belize Valley consists of rolling hills at the base of the Vaca Plateau and the Maya Mountains and is above the confluence of the Mopan and Macal Rivers. The central Belize Valley runs from the confluence of the Mopan and the Macal to the capital of Belize, Belmopan (Figure 1). The lower Belize Valley sees the river through savannah and low swamplands before it empties in the Caribbean Sea (Chase and Garber 2004:1-3). Soils in the

floodplain of the Belize River were extremely fertile (Fedick 1988; Ford and Fedick 1992). The Belize River was not only a particularly fertile location for Maya agriculturalists but it provided a route for transportation and communication between the central Maya lowlands and the Caribbean Sea. It is possible to travel by canoe from the Caribbean to the confluence of the Mopan and Macal Rivers. Portaging is necessary to travel further up either river (Yaeger 2010a:234). In addition to the rich agricultural soil bordering the river, the limestone foothills above the Belize River contain chert strata, useful for tools. The Maya Mountains, to the south, accessible via the Macal River Valley, provide lithic resources of granite, for *mano* and *metate* grinding stones, slate and pyrite, for personal adornment, pine, for ritual use, and deer, among other food sources (Yaeger 2010a:235). The Belize Valley's abundant natural resources made it a desirable location for ancient Maya settlement and attracted the attention of more politically powerful Maya cities seeking to benefit from these resources. The material culture left by these settlers over the 2000-year occupation of the valley provides invaluable insights into the development of ancient Maya social complexity.

Belize Valley: History of Research

The Belize River Valley (Hoggarth 2012:37) has seen nearly a century of archaeological exploration (Bullard and Bullard 1965; Chase and Garber 2004; Coe and Coe 1956; Gann 1918; Leventhal and Ashmore 2004; Mackie 1985; Ricketson 1931; Sharer and Traxler 2006; Thompson 1930, 1931, 1942; Willey et al. 1965). The earliest archaeological work was done in 1924 at Baking Pot by Ricketson (1929), followed by sporadic short-term reconnaissance surveys and excavations (Satterthwaite 1951;

Thompson 1940; Coe and Coe 1956; MacKie 1961; Bullard and Bullard 1965). Gordon Willey's settlement survey and excavation of the Barton Ramie hinterlands, now known to be part of the site of Lower Dover (Hoggarth et al. 2010), ushered in the age of modern archaeological investigation in the Belize Valley.

Willey and colleagues (1965) cleared and mapped 264 mounds at Barton Ramie over an area of $2km^2$. Their conclusion, that the residential history of Barton Ramie was more architecturally complex and had unexpected temporal longevity, challenged the paradigm of commoners as a simple, uninteresting part of Maya society (Chase and Garber 2004:5). At this time little was known about this part of Maya society – common people who farmed, crafted, and traded for their subsistence – especially with regards to their relationship with the greater Maya world. Willey's work set the stage for researchers to excavate the remains of commoner houses and to attempt to integrate them into models of social complexity and organization.

In the early 1980's, researchers began to consider the development of social complexity and culture history of the Belize Valley. The agenda of the Belize River Archaeological Settlement Survey (BRASS) was to elucidate how resource quality and distribution on the landscape influenced settlement. The survey covered 500 hectares of land and showed that settlement distribution correlated strongly with soil quality (Fedick 1988, 1989; Ford 1984). These data advance our understanding of how the ancient Maya social hierarchy was supported by available agricultural and natural resources.

Archaeological projects working in the Belize Valley in the 1990's focused their attention on major centers that had yet to be completely excavated including Cahal Pech, Baking Pot, Buenavista del Cayo, Nohoch Ek, Las Ruinas de Arenal, Actuncan,

Blackman Eddy, and Xunantunich (Aimers 1997; Audet 2006; Awe 1992; Ball and Taschek 2004; Conlon 1993a, 1993b; Garber 2001; Garber et al. 2004; Healy et al. 2004; Lucero et al. 2004; McGovern 1992, 1993, 1994; Taschek and Ball 2003; Taschek and Ball 1999). The goals of these projects varied, although generally they established a better chronology for the Belize Valley, and addressed questions of social complexity, community integration, and regional settlement hierarchy. The Belize Valley Archaeological Reconnaissance Project (BVAR), the Belize Valley Archaeological Project (BVAP), and the Xunantunich Settlement Survey (XSS), in particular, conducted extensive settlement surveys along the central Belize River and in the upper Belize River Valley between the Mopan and Macal rivers, respectively (Ashmore et al. 1993, 1994; Ashmore 1994, 1995, 1996; Neff et al. 1995; Yaeger 1992; Yaeger and Connell 1993). Importantly, the settlement surveys of the BVAR, BVAP, and XSS identified numerous mid-level sites that form the foundation of this study (Figure 1).

Recent research in the upper Belize River Valley has focused on better understanding the link between political capitals, like Actuncan, Buenavista del Cayo, and Xunantunich, with hinterland communities (Peuramaki-Brown 2012; Yaeger et al. 2009, 2010; LeCount and Yaeger eds. 2010) as well as clarifying activity at these and other sites in the Preclassic and Postclassic (Brown et al. 2010; Hoggarth 2012; Keller 2011; LeCount 2004; LeCount et al. 2011; LeCount et al. 2013; Mixter et al. 2013). Researchers have also taken interest in the central Belize River Valley, near the modern city of Belmopan, to better understand ritual and power at elite and commoners and to explore overland trade routes from the Belize River to the New River (Harrison-Buck et al. 2012; Lucero 2002). Excavations at hinterland sites along the Belize River show that

agriculturalists throughout the Belize Valley had a long, complex social and ritual history (Iannone and Connell eds. 2003; Robin ed. 2012; Yaeger 2010b).

The extensive excavation data makes a detailed analysis of ritual and social practices possible at sites throughout the Belize River Valley. Some sites have shown commonalities in mortuary practices, particularly body position and burial location, which diverge from sites in the central Belize Valley and just outside the valley. These differences merit exploration to determine if they were consistent through time and if they were specific to certain persons or groups.

Belize Valley: Culture History

The following section provides detail on ancient Maya culture history with respect to social complexity and the evolution of centralized authority in the Maya area. Researchers posit that ancestor veneration was a key ideological tool used by the royal elite to centralize their authority. However, I argue that this practice could have been used by all parts of Maya society to meet their goals. The Belize Valley provides an opportunity to focus on how these ideas played out in one region at different levels of social organization during crucial episodes of sociopolitical transformation.

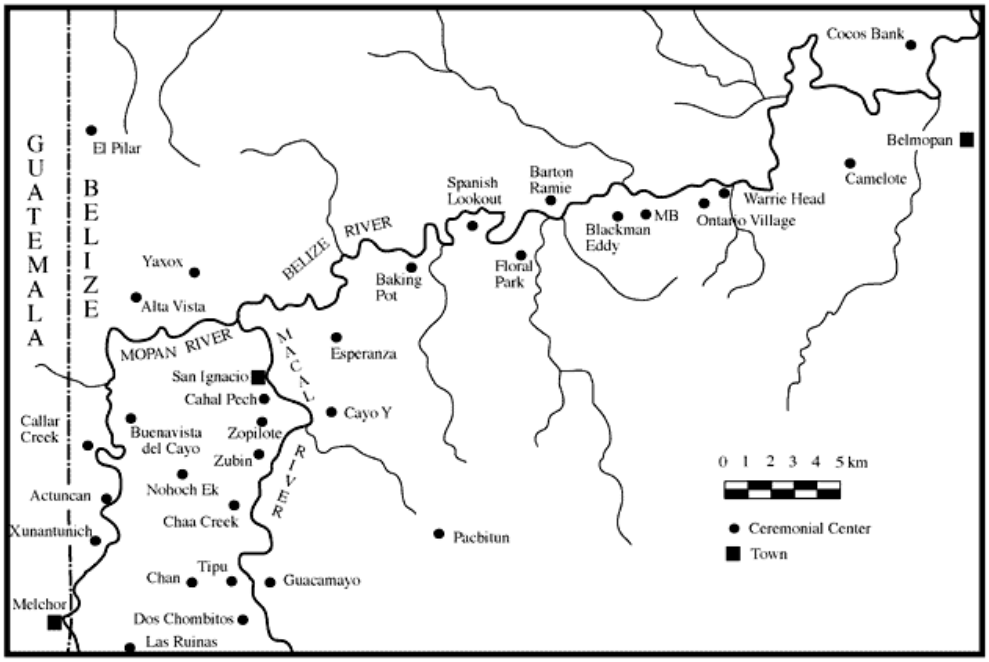

Figure 2. Major and minor centers in the Belize Valley (Garber et al. 2004:3)

Early and Middle Preclassic Periods

In the Early and Middle Preclassic (1400-400 B.C.) there were complex chiefdoms or archaic states with religious and political leaders throughout Mesoamerica, in central Mexico, the Valley of Oaxaca, and the Pacific coasts of Mexico and Guatemala (Demarest 2004:14-15; Sharer and Traxler 2006:219). In these regions evidence of social complexity emerges with the beginnings of hieroglyphic writing, a calendrical system and monumental art and architecture, such as palaces, temples, and E-groups (Martin and Grube 2000:8). E-groups are architectural complexes found at sites throughout the Maya area initially thought to be celestial observatories (Aimers and Rice 2006; Chase and Chase 1998). Monumentality implies control of a labor force, characteristic of both competing chiefdoms and emerging states (Marcus 2003:84). Other characteristics of growing social complexity include regional site hierarchies, status distinctions in access

to resources, infrastructure for intensive agriculture like the construction of canals, external trade connections, and ritual activities like sacrifices and feasting. In the later Middle Preclassic, the cities of Nakbe and El Mirador were established in the central Maya lowlands, and Kaminaljuyu was established in the southern lowlands (Marcus 2003:80, 82). Non-elite population provided labor for constructing monumental centers, agricultural production, and crafting goods for trade (Sharer and Traxler 2006:221).

Despite the apparent control of a labor force, political authority was not completely centralized; it focused on communication between non-human beings and leaders in huge temple complexes. Huge masks depicting celestial gods associated with rulership adorned temple facades during the early Pre-Classic period (Freidel and Schele 1988). There is also no evidence of elaborate tombs or tribute to individual rulers as there is in the Classic period (Sharer 1992:134). Sharer and Traxler sum up the common sentiment that "it was probably perceived communication with the supernatural forces believed to control the universe that provided the essential foundation of the power of the emerging elite rulers and their kin . . ." (Sharer and Traxler 2006:220-221).

Although it is not known whether ethnically Maya people settled the Belize Valley first or pushed out earlier groups (Ball and Taschek 2000, 2003), by the Early Preclassic (1400-1000 B.C.) prominent hilltops and their surrounding floodplain in the upper and central Belize River valley were settled, including Cahal Pech, Blackman Eddy, Chan, Barton Ramie, Xunantunich, Actuncan, and Pacbitun, among others (Ashmore 2010:48; Awe 1992:106-143; Garber et al. 2004; Healy et al. 2004:123). These groups engaged in long distance trade, evidenced by greenstone, obsidian, and marine shell (Awe 1992; Garber et al. 2004; Robin 2012b). The earliest architecture consists of

leveled bedrock living surfaces and associated postholes for pole and thatch structures (Awe 1992; Garber et al. 2004:33). By the Middle Preclassic (circa 900 −700 B.C.) pole and thatch superstructures were supported by low, tamped marl platforms at Blackman Eddy and Cahal Pech. Eventually, rectangular structures faced with cut stone blocks replaced the marl platforms throughout the Maya area, as well as in the Belize Valley (Coe and Coe 1856; Hohmann and Powis 1999; Hansen 1998). At Blackman Eddy, a stone platform is associated with shell deposits indicative of feasting events. Fragments of a stuccoed mask were revealed on the facade of Structure B1 at Blackman Eddy, the earliest example of sculpted building facades in the lowlands (Brown and Garber 1998). Stuccoed masks representing celestial beings are linked to divine kingship at other sites in the lowlands (Freidel and Schele 1988). At Chan, a series of bedrock caches and a Middle Preclassic burial show rich ritual life of the occupants early in Maya history. At Cahal Pech, Awe identified pan-Mesoamerican symbols on greenstones, ceramics, and figurines from these early contexts, the *kan* cross and avian serpent motifs in particular. These motifs are found on artifacts throughout the valley, including Blackman Eddy (Brown 2007; Garber et al. 2004:31). Belize Valley Research has shown that tenets of Maya culture have considerable time depth, and that social differentiation in the Belize Valley probably started as early as 900 B.C.

Late Preclassic Period

The Late Preclassic period (400 B.C. – A.D. 250) saw important sociopolitical changes across the Maya world (Reese-Taylor and Walker 2002). Population continued to grow in the Late Preclassic period, evidenced by both the increased size of established

and new centers as well as the density of settlement across the Maya lowlands (Sharer and Traxler 2006:251). During this time hallmarks of Maya culture were well-established, including hieroglyphic writing, time keeping, carved portraits of rulers, in addition to Classic period political organization (Demarest 2004:15; Martin and Grube 2000:8). Political organization included the idea of divine kingship, which Freidel and Schele (1988) hypothesize crystallized during this period. Divine kings were rulers that drew power from apparent connections to supernatural beings. As the Late Preclassic transitioned to the Classic period, a small collapse of sociopolitically dominant sites ensued, leaving a power vacuum in the lowlands (Sharer and Traxler 2006:295).

The Late Preclassic saw the rise of a few smaller nodes of settlement around already established centers at Actuncan, Arenal, Blackman Eddy, Buenavista del Cayo, Cahal Pech, El Pilar, Nohoch Ek, Pacbitun, Xunantunich. These nodes included formal architecture in the form of plazas, platforms, and pyramids that "mark[ed] these places as focal points for communal gatherings as well as . . . nascent displays of wealth and power" (Ashmore 2010:48). During the transition to the Late Preclasssic in the Belize Valley, we see an increase in organized ritual behavior. Round platforms were constructed that likely held a ritual purpose (Aimers et al. 2000). Ashmore (2010:47) suggests that these constructions represent a "crystallizing canon for settings of social integration." Several sites, including Actuncan, Arenal, Baking Pot, Barton Ramie, Cahal Pech, San José, Chan, and Xunantunich, among others, display their links to the greater Maya world through E-group complexes. Ashmore interprets the presence of masks and E-groups in the Belize Valley as evidence of "self-promotion and affiliation by emulation" of royal elites (Ashmore 2010:48; see also Garber et al. 2004).

Classic Period

The Classic period, lasting from A.D. 250-800, is considered the height of Maya elite culture. Kings at cities like Tikál, Copán, Calakmul, and Palenque, established dynasties that controlled regional "superstates" (Marcus 1983; Demarest 2004). In the Early Classic, several Maya cities are influenced by the distant city of Teotihuacan. The nature of the relationship between these cities and Teotihuacan remains unknown; it is still debated whether the Teotihuacanos established intrusive political dynasties or whether an alliance strengthened the power of established rulers (Braswell 2003; Bell et al. 2004). Regardless of the mechanism, the opulence and political rivalry of the Maya elite reached its height in the Classic period.

Political power was based on an established lineage and associations with their ancestors. Individual rulers were honored in carved portraits as well as and mortuary temples containing opulent tombs. While the notion of ancestor veneration has deeper temporal roots in Maya culture (McAnany 2013[1995]), Maya dynasts put the idea of ancestors to full use as support for their political power (Demarest 1992; Freidel 1992). Sharer and Traxler (2006:295-297) describe political power as continuing to stem from the coercive power of royal dynasties during this period. They explain that "to be successful, the actions of Maya kings had to conform to the prevailing cultural and ideological standards within Maya society . . . both ruler and ruled shared common concepts about power and its application that allowed the state to be managed effectively".

Recent research shows that the Early Classic was actually a dynamic time in which many sites were initiating new construction and trading with cities in the Petén

region of Guatemala (Robin 2012b; LeCount 2004; Awe and Helmke 2005). Audet argues that in the Early Classic many Belize Valley sites had some degree of political autonomy. The caches and tombs made during the Early Classic were extremely wealthy and construction was continuous in the site centers of Buenavista de Cayo, Baking Pot, and Cahal Pech (Audet 2005:345). In the middle Late Classic, the amount and quality of items placed in tombs decreased. Audet (2005) suggests that this indicates a delay in economic growth and possibly an increase in tribute responsibilities, possibly to Naranjo (Audet 2006:348).

By the Late Classic period (A.D. 600-800), the Maya states were bitter rivals who fought to maintain dominance. Regionalism is evidence by locally distinct architectural and iconographic styles (Demarest 2004:226). Shifting alliances had direct effects on sites in the Belize Valley during the Late Classic, more than in preceding eras. After a century of political conflict with more powerful neighbors, the city of Naranjo, located southwest of the Belize Valley in modern day Guatemala, became the most powerful center in the eastern Maya lowlands when a new dynasty was established there in A.D. 700 (LeCount and Yaeger 2010b:339; Martin and Grube 2008:73). The new ruler, Lady Six Sky, and later her son, extended their influence in the eastern lowlands through military campaigns and gifting of painted ceramic vessels (LeCount and Yaegar 2010b:339). The resource-rich Belize Valley was one such target of their attention. Gifted ceramic drinking vessels with texts identifying the owner and commissioner have been found at Xunantunich, Baking Pot, and Buenavista del Cayo (Ashmore 2010: 54; Audet and Awe 2005; LeCount and Yaegar 2010b:340).

The construction of a new palace complex at Xunantunich around A.D. 700 suggests that a new set of rulers gained control (Yaeger 2010b:153-156). These people could have been local elites or a family that was installed at Xunantunich from elsewhere. New construction resembled layouts of Petén cities more than Belize Valley sites, and ceramics show minor affiliation with Petén wares (LeCount and Yaeger 2010b:350). No royal throne was placed in the new palace, bringing LeCount and Yaeger (2010b:359) to propose that Xunantunich was subject to the political authority of Naranjo. The establishment of special use structures at one hinterland site suggests that non-local elites were actively working, through Xunantunich, to integrate the hinterlands (Yaeger 2010a). Xunantunich's hinterland population increased dramatically at this time, while settlement at Buenavista del Cayo, for instance, declined.

Mid-level centers of the upper Belize River Valley reflected this apparent re-orientation of elite political power through material culture, particularly ceramics and architecture. LeCount argues that the leaders of Xunantunich attempted to create a Belize Valley identity using Mt. Maloney black-slipped bowls, which are the most common wares found in politically charged Xunantunich rituals (LeCount 1996; 2001; 2010:228-229). Sites participated in this identity to varying degrees. For example, the San Lorenzo and Chaa Creek ceramic assemblage is dominated by black-slipped Mt. Maloney bowls in the late Late Classic. At Chaa Creek several structures were reoriented in the direction of Xunantunich in the Late Classic, and San Lorenzo had a special use structure seemingly dedicated to accommodate visiting dignitaries from Xunantunich. At the Chan site, the newest households at the site, established in the Late Classic period, show a greater use of Mt. Maloney bowls than households with longer occupation histories

(Kosakowsky 2012; Robin 2012b:323-324). Significantly, the Chan ceramic assemblage contains equal numbers of black-slipped and red-slipped bowls and jars and red-slipped vessels were also used in ritual contexts, in contrast to Xunantunich (Kosakowsky 2012:57). This suggests display of engagement with several social groups by the Chan people – upper Belize Valley and Xunantunich but other centers in the region as well (Robin et al. 2010: 324).

Terminal Classic Period

The states of the Classic period began a rapid decline of centralized political power in the Terminal Classic, which lasted from A.D. 800 to A.D.1100. Signs of decline include a decrease in construction of monumental architecture as well as a decline in the establishment of carved stone monuments. Lack of construction and carved monuments implies a weakening of central authority needed to produce these symbols of power. Where Terminal Classic monuments exist, they depict rulers along side non-royal elite, further implying weakening of central authority and power sharing (Sharer and Traxler 2006:499-503). The earliest signs of decline are seen in the western and southwestern lowland areas, where the changes associated with decline were acute.

No single cause can be linked to the dissipation of centralized authority in the form of divine kingship. In the central and western lowlands, intense competition between regional states, particularly between Tikál and Calakmul and their allies, led to warfare in the 7th and 8th centuries (Demarest 2004:226). Population at these cities was at its maximum in the late Late Classic period, reaching 100,000 people or more at sites like Calakmul and Caracol (Demarest 2004:223). The effect of supporting such large

populations in a fragile rainforest environment eventually took its toll. Ecological research in the central lowlands shows persistent environmental problems including deforestation, erosion, rainfall fluctuations, and drought. A combination of political instability due to warfare coupled with steady environmental degradation brought the Maya states to the tipping point.

It is noteworthy that several locations in the Maya area did not suffer such a precipitous decline. The southern highlands, parts of Belize, and the northern lowlands all saw an increase in population and were able to maintain centralized political authority. The northern lowlands, in particular, flourished in the Postclassic period (A.D. 1100-1500).

The Belize Valley experienced significant political fluctuations at this time. As Naranjo declined in the early Terminal Classic period (A.D 800-850), Xunantunich emerged as an autonomous polity, evidenced by carved monuments and an emblem glyph (Awe and Helmke 2014; Helmke et al. 2010). Contraction of Naranjo's power allowed Xunantunich to regain political autonomy. Carved monuments were erected in the early 9th century attesting to the military prowess of the Xunantunich rulers (LeCount and Yaeger 2010b:364). However, during the early Terminal Classic the throne room in the palace held three thrones, suggesting centralized authority was weak at Xunantunich as it was throughout the Maya area at this time (LeCount and Yaeger 2010b:353; Yaeger 2010b:156). Though constructed only decades before, the palace was sacked around A.D. 800 and never rebuilt; Xunantunich was abandoned by approximately A.D. 875 (LeCount and Yaeger 2010b: 341; Yaeger 2010b). Rituals continued to be performed outside the site center into the Postclassic period (Brown et al. 2010), perhaps indicating

an attempt to break with the ideologies espoused by the Late Classic Xunantunich regime.

The upper Belize Valley sites of Cahal Pech and Buenavista del Cayo were abandoned in the early Terminal Classic, with the mid-level center of Zubin abandoned slightly later at A.D. 875 (Audet 2006:351; Iannone 1996). The Chaa Creek region was abandoned by A.D. 800 (Connell 2000). The Chan site, and other upper Belize Valley settlements, saw a dramatic population decline in the Terminal Classic, although it was the most recent residents that chose to leave (Robin et al. 2010; Robin 2012b:326). Those that remained constructed an altar in the center of the Chan site core that they continued to visit into the Postclassic period (Blackmore 2001; Robin et al. 2010). Environmental degradation was not the cause of the abandonment of Chan; pale botanical analyses show that old-growth forests were maintained by the Chan residents into the Terminal Classic (Lentz et al. 2012). Saturday Creek, in the Central Belize Valley, had remnant populations until about A.D. 1150 (Lucero et al. 2004).

Baking Pot flourished for a short time in the Terminal Classic. Construction took place in the palace and at least one elite burial was interred with a carved jade pendant (Audet 2006: 352). The Baking Pot site core was abandoned in the Terminal Classic (Audet 2006:336). Hoggarth's (2010) excavations of house groups in the Baking Pot settlement show that there remained a relatively thriving population in this part of the Belize Valley. Aimers (2004:317) notes that the settlements that thrived in the Terminal and Postclassic were those near canoe portages or near prime agricultural land.

Conclusion

The history of the Belize River Valley is well-documented archaeologically and covers all parts of society, from kings to crafts people and agriculturalists. The importance of regional coverage for reconstructing the ideological systems through mortuary rituals cannot be overstated. While mortuary samples do not represent the living population at one point in time, casting a wide net across sites and through time increases the chance of making accurate inferences about ideologies and lifeways in the past. I now turn to the particular sites used for this study in more detail, some of which were mentioned in the preceding discussion of Belize Valley culture history.

Site Descriptions: Upper Belize River Valley

Xunantunich

Xunantunich was explored by early archaeological expeditions to western Belize (Thompson 1940; Satterthwaite 1951; Mackie 1961, 1985; Pendergast and Graham 1981), the human remains studied here were recovered by the excavations of the Xunantunich Archaeological Project (XAP) and the Tourism Development Project (TDP) (Audet 2006; Leventhal ed. 1992, 1993, 1994, 1995, 1996).

Xunantunich is located on a hilltop in the upper Belize River Valley region along the western bank of the Mopan (Leventhal 1992). While there is some evidence for occupation on the hilltop as early as the Middle Preclassic (Brown 2009, 2010; Brown et al. 2010), the bulk of the architecture in the site center was constructed around A.D. 750 and was occupied only 200-250 years, until A.D. 950/1000 (Leventhal 1992). The site

core is marked by El Castillo, a pyramidal structure bordering the south side of the central plaza that reached a height of 43 meters in its final construction phase. The plaza is accessed by a *sacbe* entering from the east, and is enclosed by the Castillo, an elite residence, and temple and administrative buildings (Leventhal 2010). Burials were recovered from a temple on the eastern side of the plaza dating to the Late Classic (Audet and Awe 2003, Audet 2006) and within the Late Classic palace (Yaeger 2005). This structure (A4) contained a bench with at least four individuals inside, a practice not seen at other sites in the Belize Valley. Exavations are ongong here and may reveal more burials within this and neighboring eastern structures (Awe personal communication 2015).

Actuncan

Actuncan was first documented by Thomas Gann in (1918) and again in 1954 by Michael Stewart (McGovern 1993). Actuncan was first systematically investigated as part of the Xunantunich Archaeological Project (XAP) by Dr. James O. McGovern (1992, 1993, 1994, 2004). Lisa LeCount resumed excavations at Actuncan in 2001 (LeCount 2004; LeCount and Blitz 2002; LeCount and Blitz 2005; LeCount et al. 2011; LeCount et al. 2013).

Actuncan is located 2 km north of the site of Xunantunich on a small hilltop above the western bank of the Mopan River. McGovern found that Actuncan was occupied beginning in the Late Preclassic through the Terminal Classic, although construction and occupation was scant in the Late Classic period (LeCount 2004:31). The site core consists of two zones of architecture, Actuncan South and Actuncan North.

Actuncan South consists of a triadic group constructed on a hilltop modified into a platform 3-5 meters high and 72x120 m in area. It was built mostly during the Middle and Late Preclassic periods. A causeway connects Actuncan South to Actuncan North, which was the Classic period focus of activity. Actuncan North consists of a Plaza (C), a ball court, range structures, and pyramids. Smaller plaza groups, likely containing elite and non-elite residences, are located northwest of the site core (LeCount 2004:30). Actuncan is considered the ancestral shrine of the Late Classic capital of Xunantunich (Ashmore and Leventhal 1993 cited in LeCount 2004:30). The burials recovered from Actuncan date to the Late Preclassic and Late Classic periods. Original contextual data are not yet available as excavations are ongoing.

Chan and Chan NE

Chan was first identified by the Xunantunich Archaeological Project Settlement Survey (XSS) as part of a transect running southeast 8 km from Xunantunich to Dos Chombitos, near the Macal river (Ashmore et al. 1994). Cynthia Robin first excavated households at Chan from 1995-1997 (Robin 1996; 1999). Robin returned to investigate the Chan site center from 2002 to 2009 (Robin 2012:8. Also investigated, as part of the Chan project, was a residential complex located northeast of the Chan site center, called the Northeast group, by Dr. Chelsea Blackmore (Blackmore 2008).

The site of Chan is located in the upper Belize Valley region between the Mopan and Macal Rivers in west-central Belize. Occupation of the site spanned 2,000 years (800 BC to AD 1200). The Chan site center crowns a prominent hilltop and consists of two plazas, the West Plaza and the plaza surrounded by the Central Group. Chan's Central

Group includes an elite residence, an administrative structure, and an E-group complex. E-groups often contain ritual deposits, caches, and human burials. The burials included in this study came from the Central Group, predominantly from the eastern and western structures of the E-group, as well as the northern structure of the E-group and one structure in the West Plaza. The site center is surrounded by hillsides terraced for farming and interspersed with the residences of the farmers who worked those fields (Robin 2012:8-12). Interestingly, one interment dates to the Middle Preclassic period (650 B.C. – 350 B.C.) (Kosakowsky 2012) and shows evidence of not one but two episodes of re-entry. This is one of the earliest examples of re-entry into graves in the Belize Valley.

Burials were recovered from Chan's Northeast group as well. The Northeast group was occupied from the Early Classic to the Terminal Classic period (AD 250-900) (Blackmore 2008). The group consists of six mound groups and two isolated mounds surrounded by hills terraced for farming. Blackmore defines these mounds as a neighborhood that shared kinship, social, economic, and ritual activities (Blackmore 2012:176-177). Burials and caches were recovered from three residential groups (NE-1, NE-3, and NE-6). NE-6 seems to have functioned exclusively as a domicile. Group NE-1 and NE-3 each had more variety in their artifact assemblages and more evidence for ritual activity in the form of burials and caches, as well as community activities like feasting. The burials from Chan NE are characterized by several multiple individual interments and one grave dug almost completely into bedrock.

Zubin

Identified during survey of the Cahal Pech periphery, the site of Zubin was excavated between 1992 and 1998 as part of the Belize Valley Archaeological Reconnaissance Project (BVAR) by Gyles Iannone (Awe and Brisbin 1991; Iannone 1993, 1994, 1995). Zubin is located in the upper Belize River Valley 2 km south of the site of Cahal Pech on an east-west oriented limestone ridge near the banks of the Macal River (Iannone 1993:10). Zubin was occupied from 850 B.C. to A.D. 875, with the Preclassic and Early Classic activity limited to those of a hilltop shrine (Iannne 2003:14). The group took on residential function in the Late Classic (AD 600-900). One burial from the earlier time period suggests that the site functioned as a location for divination, while the later burials are very similar to those found at other mid-level sites. The site core consists of three plazas (A-C) surrounded by pyramidal and range structures. Plaza A contains the largest architectural complex at the site. It consists of a plaza enclosed by pyramidal structures on its eastern and western edges. Range structures mark the north and south sides of the plaza. Plaza C is a raised, open activity area marked by a pyramid on its eastern perimeter, from which burials were recovered. Since burials were recovered only from the structures surrounding Plazas A and C, Plaza B is omitted from the current project.

Tolok

Originally identified during survey of the Cahal Pech periphery, Tolok was excavated from 1991-1993 as part of the Belize Valley Archaeological Reconnaissance Project by Dr. Terry Powis (Powis 1992, 1993, 1994). The Tolok Group consists of 12

structures located on a narrow ridgetop 508 meters southeast of the Cahal Pech site core (Powis 1993:97). Occupation spans the Late Middle Formative (600-300 B.C.) to the end of the Late Classic period (A.D. 800-900) (Powis 1993:112). Structures 1 and 2 are the largest and are centrally located on the ridge. A cluster of mounds grouped around a patio are located southwest of these pyramids. Excavations in the patio uncovered a circular structure that contained several Late Classic burials, which are included in this study (Powis 1993:112; Song 1993, 1994). Round structures containing series of later interments provide an interesting counterpoint to the emphasis given eastern structures as ancestral locales.

Tzotz

Tzotz was excavated in 1989 and 1991 by James Aimers (Awe, Aimers, and Blanchard 1992). Tzotz is a settlement cluster of four mounds constructed on a 22 x 21 meter platform located 100 m south of the Cahal Pech site core. Excavators encountered the remains of a round structure, Structure 2, beneath these buildings as well as human burials. A total of 7 burials containing 9 individuals were recovered from Structure 2 (Maar and Varney 1993). Again, round structures from an early time period with intrusive burials from the Late Classic are a distinct pattern of the mortuary schema of the Belize River Valley and will be discussed in more detail below.

Chaa Creek: Stela Group and Plantain Group

Survey and excavations at Chaa Creek were carried out between 1992-1997 by Sam Connell as part of the Xunantunich Archaeological Project (XAP) (Yaeger and

Connell 1993; Connell 1993, 1994, 1995, 2000). The sites in the settlement zone of Chaa Creek are located 6 km east of Xunantunich on limestone ridge crests separated by seasonal creek beds and are bounded by the Macal River to the east, inhospitable ridges to the south, and leveled agricultural land to the north and west (Connell 2003:29).

Three minor centers were excavated within the Chaa Creek settlement zone: Stela Group, Plantain Group, and Tunchilen Group. Due to their architectural and artifactual differences, Connell suggests that each site served a different function: ancestor veneration and divination, elite residence, and feasting facilities, respectively. The Tunchilen Group lacked burials, and thus was omitted from the current project.

Activity at the Stela Group dates from to the Late Preclassic period (75 B.C. – A.D. 400) (Connell 2003:30). The group consists of a plaza surrounded by a 5 m high pyramid to the east, a long platform to the south, and a 3 m high building to the west with the northern edge of the plaza left open. A small causeway entrance ramp leads into the plaza from the east. Two uncarved stelae were recovered in front of the southern platform. Two crypts were found along the center line of the eastern structure dating to the Late Preclassic; each held the remains of an elderly male individual.

Occupation of the Plantain Group dates predominantly to the Late Classic period, with abandonment of the buildings dating to about A.D. 800. Plantain Group consists of two long, range structures, each 2-3 meters tall, constructed on a 2 m high platform. Stucco sculpture and finely made personal possessions recovered from the structures and plaza suggest that the buildings were home to an elite family in the Late Classic period. Burials were recovered from the plaza and the range structures. Burials at the two groups from Chaa Creek are distinctly different from each other. The Late Preclassic burials at

the Stela Group seem more traditional in the sense that they contain single individual interments in an eastern structure. The later burials at the Plantain group consist of several graves containing multiple individuals, one of which is in the group's patio.

Site Descriptions: Central Belize River Valley

Baking Pot

A major Belize Valley center surrounded by settlements and located south of the Belize River, Baking Pot was first excavated in 1924 by Oliver Ricketson (Ricketson 1931) and again by Arthur Anderson in 1949 (Willey et al. 1965). It was mapped by Willey and colleagues during their 1956 survey and Bullard and Bullard (1965) excavated in the site core in 1961. In 1992 BVAR commenced systematic, long-term excavations of the site center and settlement of Baking Pot (Awe and Helmke 2008; Conlon 1992, 1993, 1995; Conlon and Ehret 2000, 2001; Conlon and Powis 2004; Moore 1999; Audet 2006; Hoggarth et al. 2010, 2012; Piehl 1997a, 1997b, 2005, 2008). Significant parts of the site center and residential groups have been mapped and investigated archaeologically. Burials from several parts of the site, including the site core and housemounds, are included in the present study.

Baking Pot is the largest center in the central Belize River Valley (Willey et al. 1965). The site core consists of two architectural zones linked by a causeway, with three other causeways leading away from the main groups. Group I consists of three plazas, the most dominant of which is Plaza II. Range structures and pyramidal buildings, the tallest of which are 13 m high, enclose the plaza. Burials were recovered from Structure E

(Group I, Plaza II), which forms the eastern side of the Group I plaza (Piehl 2005:39-40). Although it reached its sociopolitical peak in the Late Classic, Baking Pot was occupied from the Middle Preclassic to the Middle Postclassic (Awe and Helmke 2008; Hoggarth et al. 2010; Jobbova 2009). No burials were recovered from Group II so it is omitted from the current study.

There has been significant investigation of housemounds surrounding the site core. Burials recovered from several of these structures have been included here as a comparison to burials from eastern structures. The majority of these burials date to the Late Classic, with four dating to the Early Postclassic period (Hoggarth 2012). Baking Pot is a site that contains the most variability in architectural contexts and illustrates the difficulty of classifying sites as upper-, mid-, or lower-level in the Belize Valley.

Barton Ramie and Lower Dover

Barton Ramie is located 5 km east of Baking Pot in an oxbow on the north bank of the Belize River. Barton Ramie was the topic of Gordon Willey and colleagues' settlement survey of the Belize River Valley in 1954 (Willey et al. 1965:16). The skeletons used in this study date to Willey's excavations. BVAR returned to Barton Ramie to survey in 2007 (Jobbova 2008). The settlement known as Barton Ramie is now thought to be related to the larger site of Lower Dover (Guerra and Arksey 2011).

Willey and colleagues identified three types of structures – 1) single, small mounds, 2) plazuela mounds, and 3) a group of three or four structures around a small, raised plaza, and temple mounds, with at least one pyramidal structure, of which there was only one within the project boundaries (Willey et al. 1965:34). Burials from three

settlement types were analyzed to provide comparison to eastern structures thought to be associated with ancestral activity. My research will focus specifically on two mounds, Mound 1 and Mound 123 because they were excavated extensively and thus represent the full span of Maya history at Barton Ramie and contained numerous burials. Mound 1 contained 24 burials, some associated with a round structure. Round structures are relatively rare in the Maya area and are interpreted, at least in the Belize Valley, as lineage shrines (Awe et al. 1991:119-140; Aimers et al. 2000:81). Burials date mostly to the Late Classic, but occupation spans the Preclassic to Postclassic periods (Willey et al. 1965:17, 90). Mound 123 has 35 burials that span the Middle Preclassic to the Late Classic periods (Willey et al. 1965:125). This is one of the largest samples of commoner skeletal remains in the ancient Maya lowlands and constitutes most of the lower-level burials. Interestingly, one group contained an individual who was interred in a seated position, which is not common anywhere in the ancient Maya lowlands (Welsh 1988; Pereira 2013). This demonstrates the variability in mortuary treatment even within the sites types used for this study.

Lower Dover is located 5km east of Baking Pot on the south side of the Belize River. This larger site center was only recently excavated and revealed only a few burials, which are included here (Wilkinson and Hude 2010; Guerra 2010; Guerra and Morton 2011; Guerra and Arksey 2011).

Site Descriptions: Lower Belize River Valley

Saturday Creek

Saturday Creek was explored by the Valley of Peace Archaeological Project (VOPA) directed by Dr. Lisa J. Lucero from 1997 through 2001 (Lucero et al. 2004). The Valley of Peace Archaeological Area is located in central Belize in the eastern area of the Belize River Valley about 40-120 m north of the Belize River (Lucero et al. 2004:87). Ceramic analysis shows that the minor center of Saturday Creek was occupied form the Middle Preclassic to the Postclassic periods (900 B.C. - A.D. 1200), with a peak of activity in the Late Preclassic and Early Classic (Conlon and Ehret 2002:10; Lucero et al. 2004:91). The site seems to have a similar chronological trajectory as Barton Ramie (Conlon and Ehret 2002).

The Saturday Creek site center is located on a floodplain of the Belize River, with the site center located on higher ground close to the river and the residential areas further away (Lucero 2002:3). It consists of a three distinct plazas enclosed by range structures, elite residences, and temples. A temple and ball court architectural complex is located on the southeast side of the site core (Jeakle et el. 2002). The surrounding settlement, like Barton Ramie, consists of single mounds and plazuela groups (Lucero et al. 2004:91).

SC 18 was a solitary mound 1.24m high, the residence of wealthy commoners, located approximately 130 m front the Saturday Creek site center. Construction phases date occupation from AD 400-900 (Lucero and Brown 2002:18). SC 18 does not flourish until the Early Classic, although ceramics dating to the Preclassic period were recovered (Conlon and Ehret 2002:10). Six burials were found within SC 18, but only three were fully excavated. The non-excavated burials (BU 10-12) were included in this analysis as

data on their context, artifacts, and body orientation and position were noted (Sanchez and Chamberlain 2002).

SC85 was also a commoner residence, 1.34m in height, occupied from about A.D. 400-1150, although ceramics were found dating to 300-100 B.C. (Lucero et al. 2002:26). Project ceramicists report that it had a higher concentration of sherds from the Protoclassic and Early Classic periods than other mounds investigated (Conlon and Ehret 2002:10). Six burials were found in SC-85. Saturday Creek burials are notable for the extent to which they seemed to have been disturbd by later interments. There is also a seated burial at Saturday Creek, an uncommon lowland Maya burial treatment as noted above.

Site Descriptions: Non-Belize Valley

San José

The ruins of San José are located about 30km north of the central Belize River Valley (Thompson 1939:2). J. Eric S. Thompson investigated San José between 1931 and 1934 (Thompson 1939). Thompson's goal was to excavate a typical small center, sites he considered to be more representative of the general Maya culture than more commonly sought after "splendid ruins" (Thompson 1939:1). The site center consists of four architectural groups situated on a low rise in the landscape. The groups consist of residential and ritual structures, including pyramids up to 13m high and a ball court. It is slightly larger architecturally than a mid-level site as defined in the Belize Valley (Thompson 1939:46-64). San José has evidence for occupation from the Late Preclassic (San José I) into the Terminal Classic and Early Postclassic (San José IV and V). The site

began as a small village but developed into a more important center by the Late Classic period (Thompson 1939:233). Obsidian, jade, and imported ceramics show that at its most powerful San José was linked into the greater Maya world through long distance trade. A total of 72 burials were found over the course of excavations from various contexts. Thompson describes the typical body position to be flexed with head to the south and bodies were interred in simple graves with no markers. All burials were found within architecture in the site center.

It was chosen for this study for comparison to the Belize Valley because the burial practices are notably different there, despite San José's is geographic proximity. More than half of the burials excavated by Thompson were interred in a flexed position, a position uncommon among Belize Valley burials at any point in time. Comparing the lineage structure, burial taphonomy, and other mortuary data between San José and the Belize Valley should shed light on why burial practices might differ.

Sample Selection

Remains from one locus within a site or one type of site within a settlement hierarchy can skew paleodemographic, paleopathological, and mortuary data and thus reconstruction of the life experiences and ritual traditions of ancient groups (Buikstra 1977, 1981; Beck 1995). The importance of regional projects is emphasized in the Maya case as members of all social strata interred human remains within residences and public architecture and not in organized cemetery fashion (McAnany 2013[1995]).

Over 500 burials have been excavated since the 1950's when Willey and colleagues conducted their seminal investigations of commoner households. Many of

these are not royal or elite in any way but represent the non-elite population of the Belize Valley. This unique collection provides a way to study non-elite Maya and their mortuary practices that it is not feasible to do in other parts of the Maya world.

Chronology

In order to detect change over time in mortuary practices related to ancestor veneration, I targeted burials from all time periods over a 2000-year period of ancient Maya history of the Belize Valley. Over half of the sample dates to the Late Classic period with less than 20% dating to eras prior to the Late Classic (Table 1). There are four reasons for this. First, much of the Preclassic living space was either scraped or built over in the Classic period. For example, beneath the Castillo at Xunantunich Middle Preclassic sherds have been found suggesting that there was occupation and possibly a building on the ridge top that was scraped to make way for the construction of the Castillo. Second, population increased dramatically during the Late Classic period in the Belize Valley. The settlement around the Chan site, for example, doubled in size in the Late Classic period; a simple increase in population ultimately provides more burials. Third, preservation is expected to decrease over time so it is possible that some remains disintegrated completely. Fourth, modern construction, farming, looting, and natural changes to the Belize River banks all likely contributed to the destruction of early remains. A consequence of this imbalance in the sample size is that it will be difficult to see patterning in the earlier burials rather than the later ones.

Table 1. Chronology used in the analysis and corresponding sample sizes.

Chronology	Calendar years	Count
Preclassic	1100 B.C. - A.D. 100/150	39
Terminal Preclassic	A.D. 100/150-250	24
Early Classic	A.D. 250-600	49
Late/Terminal Classic	A.D. 600-900	472
Postclassic	A.D.900-1200	9
Unknown		58
Total		651

Site types

To address the way that power was used in society at levels above the household but below the ruling elite, I targeted burials from mid-level sites (Iannone and Connell 2003; Iannone 2004). Mid-level sites are defined by having at two plazas, a temple at least 5m high, evidence of having served multiple functions (i.e. administrative, ritual, residential) (Iannone 2004). Upper-level sites include sites that have monumental architecture, carved stone monuments, multiple plazas and large temples. Lower-level sites are residential in function and here this category consists of plazuela groups dispersed on the landscape. The study was expanded to include burials from both larger and smaller sites for comparison of ancestral practices. In the analysis I also included data from upper-level and lower-level sites, listed above, to contextualize to the results from the mid-level sites. Chapter 7, Materials and Methods, describes the sample in more detail.

Architectural Context

As the goal of this project is to better understand the use of ancestral mortuary rituals as a source of power for mid-level leaders, the sample was compiled from architectural contexts associated with ancestor veneration, eastern structures, as well as contexts that are not necessarily considered ancestral for comparative purposes. The Maya interred the deceased in many architectural contexts (see Chapter 4; Ashmore 1981; McAnany 2013[1995]; Welsh 1988). Two burial patterns predominate - 1) human remains are often found in structures on the east side of plaza groups and 2) under the walls and floors or within the middens of residences. However, burials were also found under plaza floors, at the base of or beneath altars within plazas, and within other non-residential architecture within the site core. The east is associated with ancestors in Maya mythology and so burials within structures located on the east side of plaza groups are considered ancestral. Researchers suggest, also, that the Maya considered individuals interred under the floors of residences to be ancestors (McAnany 2013[1995]). The mid-level centers targeted for this study nearly always had interments within the site core, typically within a small pyramid, 5 meters in height, located on the east side of a plaza, or within other public architecture. Burials from all contexts were included as a means for comparison of contexts typically considered ancestral and those that are not.

Conclusion

The extensive excavations of the Belize River Valley sites provide the unique opportunity to investigate ideology and power among commoners at mid-level sites. No

other sample of skeletons in the Maya lowlands includes so many individuals from non-royal, non-elite contexts. The fact that larger centers divided political power and there was no single overlord until the Late Classic period makes the Belize Valley an ideal location to study the manipulation of ideology among commoners because it seems likely that the social context warranted them the flexibility to do so. It also allows us to observe how rituals and ideology among mid-level sites may have changed in the face of larger political transformations.

CHAPTER 7: METHODS BACKGROUND

A strength of this study is that it brings multiple lines of evidence together to address the question of how ancient Maya commoners materialized their ideology. The purpose of this chapter is to elaborate on each type of data and to show not only how the method works but also to make a case for the importance of using the methods in concert. I begin by discussing biogeochemical approaches to understanding past behavior. I then turn to an historical review of mortuary analysis in archaeology and bioarchaeology. I conclude by discussing biodistance analyses and contextualize their use by discussing their application in Mesoamerica.

Biogeochemistry

Radiogenic strontium isotope analyses are used here to investigate the role local birth played in leadership among mid-level leaders of the Belize River Valley. David Stuart (2007) draws a distinction between political and social identity among royal leaders, a distinction not yet investigated among Maya commoners. Individuals buried in ancestral contexts, like eastern structures of site centers and residential groups, are expected to have been community leaders and are targeted for these analyses. Specifically, analysis of radiogenic strontium isotopes in human bone and enamel is used to assess expectation 1 – that individuals local to the Belize River Valley were venerated as ancestors at mid-level sites (see Chapter 4). In order to evaluate whether or not local residence was a part of ancestor veneration, I use the concept of residential history, defined as change in residence over the course of an individual's life (Knudson 2004:4).

In this section I review the applicability of strontium isotope analysis for this type of research and relate previous studies on residential history in Mesoamerica.

Strontium Biogeochemistry

Isotopes are atoms of the same element that have the same number of protons in the nucleus but a different number of neutrons. Because they have the same number of neutrons, isotopes of one element share the same atomic number but have different atomic masses, and, thus, different chemical and physical properties. Strontium consists of three stable isotopes, ^{84}Sr, ^{86}Sr, and ^{88}Sr, and one radiogenic and stable isotope, ^{87}Sr (Faure and Powell 1972). Strontium is found in small quantities in igneous, metamorphic, and sedimentary rocks, as is the element rubidium (Rb) (Faure and Powell 1972:6, 10-12). Rubidium has one, radiogenic isotope, ^{87}Rb, that decays to ^{87}Sr. The amount of ^{87}Sr in a rock depends on the initial amount of ^{87}Rb and the age of the rock. The half-life of ^{87}Rb is exceptionally long, 4.88×10^{10} years (approximately 49 billion years), thus after strontium is incorporated into living tissues of plants, animals, or humans, the quantity does not change for the duration of the organism's life (Faure and Powerll 1972; Faure 1986). The quantity of ^{87}Sr in an object is understood by comparing the ratio of ^{87}Sr to the stable isotope ^{86}Sr (^{87}Sr/^{86}Sr) (Bentley 2006; Ericson 1985; Katzenburg 2008). The geochemical properties of rubidium and strontium differ so that the amount of each element contained in a rock formation will thus differ depending on the age of the formation and other types of elements it contains. Thus, it is expected that the ratio of ^{87}Sr/^{86}Sr will vary geographically in accordance with the Rb-Sr system of different types of bedrock (Faure and Powell 1972; Faure 1986).

Erosion of bedrock releases biologically available strontium into soils, which is then taken up by plants through soil and water and by animals in food and water. Soil and plants are in equilibrium with the amount of strontium in bedrock (Faure 1986). Different types of rocks contain different quantities of strontium, thus the release of strontium through erosion will not be consistent throughout an ecosystem (Turekian and Kulp 1956; Faure 1986; Dasch 1969:1532). The $^{87}Sr/^{86}Sr$ ratio is an average of the rocks with the highest and lowest amounts of strontium. Studies using $^{87}Sr/^{86}Sr$ values to detect residential mobility typically report that strontium does not fractionate appreciably (Bentley 2006). However, chemical and physical properites of isotopes result in small amounts of fractionation (Knudson et al. 2010; Faure and Powell 1972). Mass-dependent fractionation occurs at increasing trophic levels, which can now be measured as mass spectrometry technology improves. Trophic level and origins of dietary strontium are being investigated using $\delta^{88/86}Sr$ (Knudson et al. 2010). It is not expected that fractionation will have a large impact on the radiogenic strontium samples reported here.

Strontium is chemically similar to calcium and substitutes for calcium in minerals, including the apatite component of human bone and teeth (Comar et al., 1957; Comar, 1963; Schroeder et al., 1972). These elements are taken up into human tissues through metabolism of food and water. Human bone is composed of about 70% inorganic hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$) and about 30% organic collagen. Dental enamel is at least 95% hydroxyapatite ($Ca_{10}(PO_4)_6(OH)_2$) (Currey 2002:6). Hydroxyapatite is composed of extremely small crystals arranged in a lattice pattern that are infused with collagen, the organic fraction of bone (Currey 2002:4-7) The integrity of hydroxyapatite varies by bone type and factors such as age; with advanced age hydroxyapatite structure

becomes more variable. Of two types of bone, trabecular and cortical, trabecular is more porous so that the body can easily resorb the bone and access essential minerals like calcium and phosphorous (Ezzo 1994:5). The variable structure of hydroxyapatite and the porosity of certain types of bone mean that other ions can infiltrate the hydroxyapatite structure (Ericson 1985; Ezzo1994; Elias et al. 1982; Lambert et al. 1985). Strontium is not an essential nutrient, meaning that the amount consumed in the diet will remain in the same abundance in the hydroxyapatite structure through the life of an organism. The geological specificity and very small degree of fractionation characteristic of radiogenic strontium isotopes means that they can be used to indicate where an individual resided during life, assuming that they consumed food and water from that geographic location (Bentley 2006).

Residential mobility over the course of an individual's life relies on comparing the relative abundances of $^{87}Sr/^{86}Sr$ in both teeth and bone. Dental enamel forms only once and then remains relatively stable over the life course. Teeth develop sequentially and thus reflect different stages through childhood and adolescence (Hillson 1996). The first molar is preferred in radiogenic strontium isotope studies of childhood residence because it begins to form in-utero. Incisors are useful since they begin to form within a few months of birth and their enamel can reflect residential mobility during this period (Hillson 1996). Bone, on the other hand, remodels at varying rates, making bone a good indicator of geographic location later in life (Price et al. 2008).

A clear view of residential mobility is important for understanding human reactions to large scale social, economic, and political circumstances like the transition to

agriculture (Bentley et al. 2002; Bentley et al. 2003), social dynamics of imperialism and colonization (Knudson 2004; Knudson and Price 2007; Knudson et al. 2004; Killgrove 2010; Montgomery et al. 2006; Price et al. 2009), long distance interaction between urban centers and ethnic composition of urban centers (Price et al. 2000; Price et al. 2010; Trask et al. 2012; Wright et al. 2010; Wright and Bachand 2009; Wright 2005a,b; Wright 2007, change in residence and settlement patterns over time (Bentley et al. 2002; Cucina et al. 2011; Ericson 1985; Freiwald 2011; Grupe et al. 1997; Price et al. 1994; Somerville 2010), and the collapse of elite sociopolitical power (Price et al. 2008). Radiogenic strontium isotope values in animal bone and teeth are also used to reconstruct ancient trade networks (Thornton 2011; Emery and Thornton 2012), and resource procurement by early hominids (Sillen and Sealy 1995; Sealy and Sillen 1988; Sponheimer and Lee-Thorp 1999; Sponheimer et al. 2005; Sponheimer et al. 2006).

Elemental Concentrations

Although elemental concentration analyses are more regularly used to investigate diet (Comar et al. 1956, 1957; Elias et al. 1982; Schoeninger, 1979; Wright, 2006), recently they have been used as a way to estimate residential mobility (Burton et al. 2003). The process of biopurification filters some strontium and barium before it can be incorporated into bone tissue and results in less of these elements in bone than is available the diet (Elias et al. 1982). The ratio of Sr/Ca and Ba/Ca decreases through the food chain; plants have less than soil, herbivores have less than plants, etc (Burton et al. 2003). The minimal effects of changes to the plant/meat ratio of the diet and large geological variability in biologically available barium and strontium, in particular,

suggest the potential utility of Ba/Sr ratios for addressing paleomobility (Burton et al. 2003). Further, as neither element is an essential nutrient the amount consumed in the diet will remain in the same abundance in the hydroxyapatite structure through the life of an organism (Ezzo 1994:8; Burton and Price 2000).

Elemental concentration data are useful for testing tentative hypotheses concerning paleomobility at Chan and Cahal Pech to investigate further using radiogenic strontium isotope analysis. Interpretation of these data is hindered by a lack of elemental data from humans or animals in the published bone chemistry studies of the Belize River Valley region (Piehl, 2005; Freiwald, 2011). Thus, data presented here can address possible differences in residence during childhood and at death but cannot say whether that location of residence was in fact the Belize Valley. Comparison to mean log(Ba/Ca) and log(Sr/Ca) values from other archaeologically recovered Maya remains provides one way to explore regional elemental differences. Elemental concentrations are also useful for assessing diagenesis and contamination.

Diagenesis and contamination

Diagenesis is the process of contamination of human skeletal material while in the burial environment. These processes obscure the prehistoric strontium signal. Because bone is more porous it is more susceptible to diagenesis. Strontium that occurs naturally in soils can be taken up by bone, which compromises the isotopic signal (Budd et al. 2000; Pate and Brown 1985; Price et al. 1992; Bentley 2006). Chemical and mechanical cleaning of the bone surface has been shown, with variable results, to remove contaminants from bone tissue (Grupe et al. 1998). However, successive washes with a

weak acid, a method often used, can cause hydroxyapatite crystals to re-crystalize, and the dissolved diagenetic strontium can be taken back up into the bone structure (Bentley 2006; Pollard et al. 2007). Many researchers choose to use dental enamel exclusively (Budd et al. 2000). Trabecular bone is more susceptible to diagenetic contamination due to its porosity (Grupe 1988:127).

Archaeological bone and tissue are susceptible to post-depositional contamination which can alter the biogenic elemental concentrations and isotopic compositions (Sillen 1989; Ezzo 1992; Budd et al. 2000; Burton and Price 2000; Hedges 2002). Monitoring the ratio of calcium to phosphorus (Ca/P), as calcium is common within groundwater, can help to identify the presence of diagenetic contamination (Lambert et al. 1991; Sillen and Sealy 1995; Nielsen-Marsh and Hedges 2000). A value of 2.16 is accepted as the Ca/P ratio in living bone (Sillen 1989; Price et al.1992; Mays 2003; Burton 2008:444). The concentration of uranium within skeletal samples can also be indicative of diagenesis as the mobile ionic form of uranium moves from within the calcium phosphate structure of the burial environment into bone hydroxyapatite (Kohn et al. 1999; Price et al. 2002).

Radiogenic Strontium Isotopes and the Ancient Maya

Price and colleagues (2008) present strontium isotope data from the Mesoamerican sites of Teotihuacan, Palenque, Campeche, Copán, and Tikál as case studies to establish that strontium isotope analysis is useful in Mesoamerica. They state that it is important to use local fauna and human values to establish the range of variation within a region. This is especially exemplified in the Palenque case study, where food was grown away from the main site where people were living so their radiogenic

strontium isotope values differed from that expected from the main site (see also Wright 2005). The authors found that differences between regions were greater than differences within regions (Price et al. 2008:171). However, it is important to remember that some regions are not completely distinct from each other. The Gulf Coast of Mexico, for instance is not distinct from the central Maya area (Price et al. 2008:171). The authors identify European and African born individuals at the early Colonial city of Campeche, as well as possible native Maya. At Teotihuacan, they identify immigrants from central Mexico that lived at the site for most of their lives.

Epigraphy implies that a Teotihuacan leader installed a king at the Maya site of Tikál in AD 379. Wright (2005b) reviewed the archaeological context and skeletal remains of male individual thought to be the king supported by Teotihuacan, called Burial 10. While the teeth from the tomb were mixed and most skeletal remains were lost post-excavation, careful shorting provided a set of teeth most likely from the principle interment. Strontium isotope analyses showed that he was most likely born locally. However, values overlap in the Maya area so the ruler could have been born elsewhere in the Petén, for instance the Usumacinta/Pasion drainage, or the southern part of the Yucatán (Wright 2005b:98).

Wright (2005a) refined the definition of "local" within the Tikál region and provided possible sources for strontium in the Tikál diet. She found that the mean strontium value for the sample of 83 skeletons is higher than values for faunal samples (freshwater snail) and limestone, which is used to treat maize before processing as tortillas. She proposed that imported sea salt could have increased the naturally bioavailable strontium levels to those seen in humans at Tikál (Wright 2005a). Trask and

colleagues (2012) propose that ingesting marine resources and salt likely resulted in higher strontium values for humans when compared to the faunal and water baseline samples at Uxbenká. Fenner and Wright (2014) recently reevaluated the hypothesis that dietary intake of salt was causing elevated levels of strontium at Tikál. Citing an error in the original analysis (Wright 2005a) their recalculations showed that the salt requirement was much higher, 9.2 g salt/day per person. The new figure, while high, is comparable to salt intake reported ethnographically (Redfield and Villa Rojas 1934).

Radiogenic strontium isotope analyses provide a way to understand long distance connections between ancient cities that previously only archaeological data could address. Trask and colleagues (2012) and Somerville (2010) investigated the connectivity of ancient Maya sites in Southern Belize to the rest of the Maya world. Several large sites in Southeastern Belize are located along an important trade route between the Caribbean Sea and the Central Maya Lowlands and Guatemalan Highlands (Prufer et al. 2011). Archaeologists have hypothesized that architectural and material culture differences in Southern Belize were due to an influx of foreign individuals. At Uxbenká, Trask and colleagues (2012) find that the strontium and oxygen values of 27 individuals are homogenous suggesting that they are all of the same origin. Pinpointing their origin was difficult, as they found that strontium values between Uxbenká and the central Petén overlap. Somerville (2010) found three individuals of non-local origin interred at Pusilhá. One, a female, was most likely born in the Motagua Valley, near the obsidian source of El Chayal, and the individuals from Burial 3/1 show values very close to those reported from the Copán valley (Somerville 2010:24). These studies imply that southern Belize

was in contact with the rest of the Maya area, and further suggests that more powerful sites like Tikál and Copán likely did not have a significant presence in Southern Belize.

Radiogenic strontium isotope analyses have been used to answer questions about non-funerary deposits and companion burials, often interpreted as sacrificial victims or trophies of war. Wright and colleagues (2010) investigated a series of wealthy Early Classic tombs containing multiple individuals surrounding a principal interment at Kaminaljuyu, located in the highlands of Guatemala. Archaeological evidence suggested long-distance contact between Kaminaljuyu and central Mexico which the authors assessed further using strontium isotopes. Her team found that principle occupants of the tombs were born in the Kaminaljuyu region. Several primary occupants were born near the site and then traveled to central Mexico during their adolescence and returned to Kaminaljuyu as adults. However, according to their $\delta^{18}O$ values, which vary based on water sources, four decapitated skulls and two other skeletons positioned peripherally to the central tomb occupants likely represent individuals from the Maya lowlands, the location of sites like Tikál, (Wright et al. 2010:173). By contrast, at Tikál, juvenile males, possibly sacrificial victims, interred with a primary burial all had local strontium values, with only one exception (Wright 2005a, 2012:350).

At the southern Belize site of Pusilhá, Somerville (2010:37) found that isotopic and trace element data show no differences in residential origin for companion burials. One burial contained a principal individual and a skull, both of which had strontium values similar to those characteristic of the Copán valley. He suggests that the skull may have been included in the grave as an ancestor (Somerville 2010:37). As discussed above, Tiesler and colleagues (2010) identified a mask made from a human skull as the only

individual with a non-local strontium value at the Yucatecan site of Xuenkal (Tiesler et al. 2010:375). The mask accompanied the deceased body of a robust male individual within a multiple individual grave used for a long period of time.

While few individuals of Teotihuacan origin have been identified in the Maya lowlands (see Wright 2012:349), individuals from the Maya lowlands have been recovered from Teotihuacan. A series of interments beneath the Pyramid of the Feathered Serpent and the Pyramid of the Moon at Teotihuacan in central Mexico are interpreted as sacrificial victims. White and colleagues (2002, 2007) found that a number of interments beneath both pyramids, young males interpreted as sacrificial victims, have strontium and oxygen values consistent with the Maya lowlands.

Radiogenic strontium isotopes have also been used to elucidate the relationship between mortuary practices including body positioning and burial location. Freiwald (2011) found that Belize River Valley individuals who were interred in a prone, head to the south position were more likely to have been childhood residents of the Belize Valley. Non-local individuals were more often partial remains and not typically found in elite contexts (Freiwald 2011:ii). Freiwald also identified changes in ancestor veneration practices, in that almost all ancestral structures contained the remains of non-local individuals (Freiwald 2011:239). At the Belize Valley site of Xunantunich, Freiwald and colleagues (2014) found that individuals with local strontium and oxygen values were regularly interred with those showing non-local values. Individuals with isotope values similar to the central Petén region were more likely to have been placed in atypical graves and positions (Freiwald et al. 2014:129). The authors concluded that body

treatment like positioning in the grave was an important sign of local or non-local identity.

Strontium isotopes are often used to identify migration of groups and individuals in the past, as well as changes in migration rates over time. Wright (2012) found that at the lowland Maya site of Tikál, 11-16% of the sample was born in other locations and migrants came from all parts of the Maya area. The highest rates of migration into the site occurred in the Early Classic period when compared to the Late Classic (Wright 2012:349). She found that women migrated more frequently in the Pre-and Early Classic eras, perhaps as elite brides, but that they are absent from the Late Classic sample of sexed skeletons, interpreted by Wright (2012:350) as evidence for small scale movement between cities of a few individuals rather than whole families in the Late Classic period. Migration was identified in burials of all social statuses (Wright 2012: 350). Wright's analyses also shows that elite males thought to be ruler's of Tikál spent their childhood in other locations, possibly attending palace schools for training in governance (Wright 2012: 350).

The diverse geology of the Belize River Valley enabled Freiwald (2011:160) to distinguish migration between the Valley and the surrounding mountains and river valleys during the Late Classic period. For instance, larger sites with shorter occupation histories had higher amounts of in-migration with the opposite being true for sites of long duration (Freiwald 2011:237). Migration occurred at a rate of 20% in the Late Classic and individuals from all social status migrated (Freiwald 2011:237-238).

Recent work at the site of Copán (Price et al. 2014) identified a foreign enclave at an elite patio group dating to the Early Classic period. The authors used strontium and

oxygen isotopes to show that over one third of the human burials at the group were not local to the Copán Valley (Price et al. 2014:32). Moreover, the strontium and oxygen values varied considerably, suggesting to the authors that the individuals interred there originated in a variety of locations (Price et al. 2014:43). Two chamber tombs were excavated and both contained a wealth of grave goods and human occupants who did not have local isotope values (Price et al. 2014:42). One of these individuals, a young adult male, was interred with, among other exquisitely crafted items, a jadeite ruler's scepter and an earspool with a mat pattern engraving, both symbols of Maya rulership, suggest that the tomb occupant was an early dynastic ruler of Copán. Grave architecture was similar to that of Yax Kuk' Mo', the dynastic founder of Copán (Bell et al. 2004; Price et al. 2014:35).

Conclusion

Radiogenic strontium isotope analyses are well developed for use in paleomobility studies in ancient Mesoamerica (Hodell et al. 2004; Price et al. 2008). The geology of the region is diverse enough to track mobility on the interregional scale. In the Belize Valley, the geology is diverse enough to track mobility between the Valley and closely surrounding mountains (Freiwald 2011). It has been used successfully to identify potential differential mortuary treatment for local and non-local individuals, residential origins of possible sacrificial victims, and patterns of migration within and between regions. Combined with *anthropologie de terrain* and biodistance analyses, strontium isotope values will be an even more powerful tool for understanding factors that contributed to protracted mortuary treatments. The following section discusses the use of

biodistance, another tool for assessing group membership as a deciding factor in mortuary treatment.

Mortuary Analysis

The classic sociological studies of Robert Hertz (1960 [1907]) and Arnold van Gennep (1960 [1909]) laid the foundation for theoretical studies of mortuary ritual. Van Gennep's (1960[1909]) work found cross-cultural support for a tri-partite structure of rituals marking life transitions. The individual is first ritually separated from a status and, second, enters a liminal period where they are not their former selves nor have they been incorporated into a new status. A final rite marks their emergence into a new status or phase of life (van Gennep 1960[1909]:20) Metcalf and Huntington 1991:31; Huntington and Metcalf 1979). Robert Hertz (1960[1907]) focused particularly on funeral rituals and drew on the tri-partite framework to address secondary burial rites in societies where death is not considered instantaneous and does not coincide with biological death. Hertz (1960[1907]:48) suggested that biological death initiates a liminal period in which the soul remains among the living until it can be reconstituted and admitted into the land of the dead. This reconstitution is associated with the decomposition of the corpse and culminates in a ritual at which the bones of the deceased are exhumed and re-interred elsewhere. The secondary burial ritual marks the time at which the soul is safely in the land of the dead. Hertz (1960[1907]:40) extended the model to the social condition of the mourners. He proposed that, like the soul and the decomposing body of the deceased, the mourners moved through a liminal state that concluded with their reincorporation into the society after the final interment of the deceased (Hertz 1960[1907]:63-64). The English language publication of these important works, and their elaboration and extension by

Huntington and Metcalf (1979; Metcalf and Huntington 1991) sparked interest in funeral rituals and beliefs about death among anthropological archaeologists (Metcalf and Huntington 1979; Huntington and Metcalf 1991; Rakita and Buikstra 2005).

Preliminary archaeological research in the late 19th and early 20th century adhered to a normative view of culture. That is, members of culture groups conformed to certain "ideational norms or rules of behavior" (Jones 1997:24). These behaviors then left discrete material signatures by which ancient groups are distinguishable from one another. Culture change was explained by contact between groups or diffusion of ideas or customs (Childe 1936 [1951]: 105; Chapman and Randsborg 1981:3; Jones 1997:25; Trigger 1989: 171). Mortuary data were one of many lines of evidence whose material similarities and changes through time were used to establish cultural, and often biological, affiliation between groups (Arnold 1990; Childe 1936 [1951]:50, 128; Chapman and Randsborg 1981:4).

By the mid 20th century, the normative view of culture held little explanatory power for archaeologists, and it was considered overly simplistic (Jones 1997:26; Trigger 1989: 298). The New Archaeology, or processualism, drew on a neo-evolutionary, functionalist perspective that culture was constituted by a system of integrated and interworking sub-systems that influenced each other in their interaction (Binford 1962, 1971; Hodder 1982a, 1982b; Jones 1997; Malinowski 1948; Parker Pearson 1999; Radcliffe-Brown 1964; Taylor 1948; Trigger 1989). The ideal culture state was equilibrium through adaptation to both external and internal forces and Leslie Whites' definition of culture as "man's extrasomatic means of adaptation" was adopted (White 1949 see also Binford 1971:23; Hodder 1982b:2). In this model, human beings are

unaware of forces that determine their behavior, such as their environment (Trigger 1989:298). Ecological influence played such a prominent role in this perspective that it was seen as a major determining factor of human behavior (Hodder 1982b:2). The New Archaeology championed the application of middle-range theory, in which ethnographic data on material culture patterning are used to build inferences about human behavior from the archaeological record, as well as data from the hard sciences such as chemistry and biology. In this way the processual archaeologist observed ethnographically how the static archaeological record was created by dynamic human behavior and used such observations to infer past behavior from the material archaeological remains (Binford 1983:19-20; 1977). The ultimate goal of the processual paradigm was to establish underlying laws of culture change, cultural evolution, and human behavior (Binford 1971:25; Parker Pearson 1999: 28).

Lewis Binford (1971), reacting against the normative view of culture-history, proposed that burial practices were not merely "fashions", as Kroeber (1927:10) had argued, but were a core aspect of social life and thus had the potential to inform our knowledge of past social dynamics (Binford 1971). Binford addressed three key assumptions. First, culture historians assumed that culture change was due solely to diffusion and culture contact. Second, it is assumed that everyone in society follows cultural customs in reference to mortuary behavior in the same manner and that distinctively different burial practices in a single society indicate "cultural mixing or hybridization". Finally, any similarities observed between discrete culture groups is a measure of the degree of genetic or cultural affiliation of these groups (Binford 1971:9).

Having sufficiently established the need for theoretical developments in interpreting mortuary remains, Binford tested three hypotheses using ethnographic data from the Human Relations Area Files to refute the assumptions of the culture-historical approach (Binford 1971:18-22). Three important conclusions were reached that laid fundamental groundwork for future mortuary studies. First, social complexity of the society, estimated by subsistence patterns, related directly to the complexity of funerary behavior. Second, social personae (dimensions of social position and affiliation) of individuals in more complex societies have more dimensions (e.g., ranking) and are more complex than the social personae of individuals in egalitarian societies and these differences are reflected in the mortuary practices of complex and egalitarian societies. Binford drew on role theory, introduced by Ward Goodenough (1965 after Linton 1936), to evaluate an individual's social position within a society (Binford 1971:17). Goodenough describes the social persona as the composite of several social identities selected as appropriate to a given interaction, in this case the social identity considered appropriate for representation in death (Goodenough 1965:7; Binford 1971:17). Finally, Binford found correlations between different dimensions of the social personae, age, sex, status, etc, and the form these dimensions took in ethnographically described mortuary practices (Binford 1971:23).

The importance of Binford's analysis is twofold. First, he quantitatively demonstrated that funerary behavior was related to the form and complexity of the society in which these rites are practiced, and " . . . variability must be understood in terms of the organizational properties of the cultural systems themselves" (Binford 1971:23). Second, he demonstrated that analysis of funerary behavior and the social

persona were valid ways to study ancient social groups (Binford 1971:23). Finally, considering the importance of social structure over ideological and cognitive processes, Binford stated that, " . . . knowledge and ideas are not sufficient causes of cultural change or variability" (Binford 1971:23). Binford's landmark study prompted accolades that he had confirmed, " . . . beyond serious contention the argument . . . that variability in mortuary practices must be understood in terms of variability in the form and organization of social systems, not in terms of normative modes of behavior" (Tainter 1978:107).

Using Binford's (1971) framework, with additional support from Arthur Saxe (1970) and refinements by James Brown (1971, 1981, 1995), researchers began to tease apart specific aspects of social organization and social persona through studies of rank, status, spatial patterning, and formation processes (Braun 1979; Brown 1971, 1995; Buikstra 1976, 1977, 1981; Goldstein 1981; Morris 1991; O'Shea 1981; Tainter 1977, 1978). These key studies adhered to the paradigm set out by the New Archaeology, rooting their research questions in correlates from the ethnographic record and using positivist, scientific methods such as formal analysis and multivariate statistics (Braun 1971; Tainter 1977, 1978). The postulates set out by Binford (1971) and Saxe (1970, 1971) were further tested and problems were identified with the method and theory on which this work was built.

The contributions of Lynn Goldstein (1976, 1981), John O'Shea (1981), and Jane Buikstra (1976, 1977) are particularly noteworthy. Goldstein (1976) continued to test the Binford/Saxe hypothesis, focusing her dissertation work on Saxe's hypothesis 8, which states that, " . . . corporate group rights to use and/or control crucial but restricted

resources are attained and/or groups will maintain formal disposal areas for the exclusive disposal of their dead, and conversely" (Saxe 1971:119). Goldstein conducted a world wide ethnographic survey and found that not all corporate groups maintained formal disposal areas but when bounded, formal disposal areas existed they were the result of corporate group social organization (Goldstein 1981:61). She pointed out a crucial implication of hypothesis 8, that, "considering the wide range of variability in cultures, there is a low probability that certain groups, even when in similar economic and environmental conditions, will symbolize and ritualize aspects of their organization in precisely the same way (Goldstein 1981:61). Goldstein (1981:57) advocated embracing the multidimensionality of mortuary behavior and suggested that mortuary dimensions can be effectively examined using spatial analysis. Such analyses can be done at a macro, site-wide level or focus on details of the grave and corpse (Goldstein 1981:58).

O'Shea (1981:40) considered how formation processes of archaeological contexts such as ritual activity prior to interment, preservation biases, archaeological recovery methodology, and the archaeologist's limited power of explanation, contribute to the formation of the mortuary record among the historic period Arikara, Omaha, and Pawnee. When taking these aspects of archaeological reality into account O'Shea's results (1981:49, 51) still demonstrated that social ranking could clearly be identified in mortuary remains. Horizontal social organization, however, remained difficult to recognize. O'Shea (1981:51) also found that mortuary symbolism varied considerably over time, which he emphasized could obscure ethnic groups in the archaeological record.

Most importantly, the New Archaeology set the stage for the advent of modern bioarchaeological research (Buikstra 1977:67). An emphasis on the interaction of the environment, culture and human biology in past populations created a niche for osteologists (Buikstra 1976, 1977, 1980). Buikstra (1977:69) advocated regionally based, interdisciplinary research in which the physical anthropologist was an active participant in the research design and all stages of its implementation.

In a 1995 study, Christopher Carr made several crucial refinements to the Binford/Saxe approach to mortuary analysis. Carr (1995) demonstrated, through ethnographic survey using HRAF data, that mortuary practices are the result of many convergent factors. Carr (1995) tested three hypotheses among thirty-one non-state societies. First, Carr (1995) tested the widely assumed Binford/Saxe argument that social organization determined mortuary behavior. Second, he evaluated the extent to which philosophical-religious beliefs structured mortuary practices. Finally, Hertz's (1960[1907]) premise that related the treatment of the corpse with beliefs about the soul and the afterlife was tested (Carr 1995:110).

Carr's (1995: 189) most important finding, for the purpose of this review, was that philosophical-religious factors determined variation of within group funerary behavior as frequently or more frequently than social organization cross-culturally, and that physical or circumstantial constraints influenced burial practices much less than philosophical-religious factors. Philosophical-religious beliefs were defined by Carr (1995:107) as, "categories of socially institutionalized 'folk' beliefs and world-view assumptions about disease, dying, death and the soul, the afterlife, and the cosmos." Carr (1995) defined social organization in his study differently than Binford (1971), who used

subsistence strategy as a proxy for degree of social organization. Carr (1995:126) characterized societies based on their social complexity and agricultural intensity as defined by Murdock (1969). He defined five classes – band-level hunter-gatherers, complex hunter-gatherers with substantive leadership positions, horticultural tribes with head mean, petty hierarchy with Big Man or chief, and multilevel, paramount chiefdoms (Carr 1995:126).

Carr (1995:189-190) concluded that the contents as well as the structure of mortuary remains hold potential for reconstruction of past social interactions. Furthermore, the most useful archaeological attributes to consider when studying philosophical-religious beliefs are body orientation, body position, and spatial arrangement of grave furniture. Thus, support was found for Hertz's premise that " . . . there is a close relationship between the representation of the body and that of the soul" (Hertz 1960[1907]; Carr 1995:191).

Opposition to the conceptual framework of the New Archaeology was voiced in the early 1980's, principally by British and European archaeologists. This "post-processual" theoretical movement addressed broad concerns with archaeological methods and interpretation (Hegmon 2003; Rakita and Buikstra 2005). At the heart of the post-processual critique regarding mortuary practices was an emphasis upon the conduct of funerary rituals, which are carried out by the living. Thus, they speak more to the use of mortuary ritual by the living mourners for social and political manipulation and less to the status and role held by the deceased during life (Buikstra 2006:197; Hodder 1982a, 1982b; Rakita and Buikstra 2005:7). Many archaeologists were receptive to this critique, though Buikstra (2006:198) points out that many still assume a direct relationship

between grave ostentation and the identity of the deceased during life. Goldstein (2001:252) encouraged archaeologists working in the southwestern United States to consider a variety of specific mortuary variables rather than only grave goods and a few general categories of data. She found including mortuary variables such as body position and spatial distribution of items group affiliations, either kin or corporate, were revealed.

Post-processual archaeologists also argued that the New Archaeology reified social organization and downplayed individual action that undoubtedly contributed to cultural variability and uniqueness (Hegmon 2003:217; Hodder 1982a:5-6; Rakita and Buikstra 2005:7; see also Goldstein 1981, 2001). The focus on vertical social organization also drew attention away from other types of organization that could have structured funerary treatment, such as horizontal societies that cross cut vertical rank and status (Carr 1995: 178, 185-188; Goldstein 2001:250; Rakita and Buikstra 2005:7). Social evolutionary typologies were eschewed by post-processualists, as were cross-cultural comparisons. Focus on specific historical and cultural contexts was encouraged (Hegmon 2003:217). In line with Binford's (1971) assertions, Hodder's (1982b:199) ethnographic data revealed that Nuba social organization was expressed through burial practices, but he also found that burial practices were filtered through beliefs about death. Burial practices were keenly influenced through beliefs about the impurity of death and level of impurity was linked to an individual's social position and role in society (Hodder 1982b:199-200). Belief systems and social meaning were considered fundamental concepts to archaeologists of the post-processual persuasion (Hegmon 2003:217; VanPool and VanPool 1999:38).

To post-processual archaeologists, material culture was infused with meaning constituted by the political, ideological, and religious structures of a society (VanPool and VanPool 1999:39). Hodder (1982a:4; 1982b: 186, 214) proposed that ideas and beliefs, symbolic or conceptual "schemes", articulated the sub-systems of culture and imbued them with cultural significance. Symbolic schemes were not merely cognitive and conceptual but were utilized as part of social strategies in economic, social, and political situations (Hodder 1982b:186; see also Morris 1991:155, 163). This spoke directly to the use of material culture in mortuary contexts, where it is often assumed that grave goods and their placement had only symbolic meaning (Renfrew 1994:47). Artifacts were also given inherent meaning by processual archaeologists. Post-processualists advocated that scholars evaluate how their modern worldview colored their interpretations (Hegmon 2003:218; VanPool and VanPool 1999:36,38).

The introduction of the post-processual theoretical perspective produced what some considered a significant rift in anthropology (VanPool and VanPool 1999:272). In particular, many processual archaeologists found it problematic that post-processual archaeologists attempted to reconstruct from the archaeological record immaterial social realities, such as Hodder's symbolic schemes (Hodder 1982b:186). Many were said to do so in an explicitly non-scientific way (VanPool and VanPool 1999:274). Michelle Hegmon (2003) described the position of many 21st century archaeologists as processual-plus. The processual-plus perspective advocates systematic and rigorous methodologies applied to themes held important to post-processualism, such as gender, ethnicity, and religion (Hegmon 2003:218). Processual-plus approaches bring multiple lines of evidence to bear using what Alison Wylie (1992) had identified as evidential constraints

to support their findings. Wylie (1992:25) described evidential constraints as " . . . not just different kinds of archaeological evidence, but evidence from a wide range of sources, which enters interpretation at different points, and which can be mutually constraining when it converges, or fails to converge, on a test hypothesis". Feminist scholars using detailed botanical and ethnographic data to address the role of women in plant domestication best exemplified this approach (Watson and Kennedy 1991). Considering evidential constraints allows for rigorous testing of post-processual themes, such as social attitudes about gender and religion, that processualists suggest cannot be recovered from the archaeological record. It also allows for the archaeologist to acknowledge their own potential biases in interpreting past behaviors (Hegmon 2003; VanPool and VanPool 1999; Wylie 1992).

The work of processual archaeologists emphasized that mortuary remains were useful for reconstructing ancient social organization and social persona. Several scholars also called attention to the importance of seeing mortuary contexts as active ritual locations that were the scene of protracted rites and not a single funerary event (Brown 1995; O'Shea 1981). Their use of positivist, scientific methodologies gives weight to their results as does their use of multiple lines of evidence from disciplines outside of anthropology such as geology, ecology, biology, and botany. The processual approach also set the stage for the sub-discipline of bioarchaeology to emerge, though, current bioarchaeological research concerning mortuary ritual would benefit from more productive collaboration with archaeologists at all stages of research design and implementation (Buikstra 1976; Goldstein 2006:376, 383).

The post-processualist critique raised important theoretical and interpretive issues and has improved the study of mortuary remains. First, post-processualists emphasized that archaeologists should be aware of the modern perspective they risk projecting onto the past. This is especially relevant when discussing issues of personhood and self for the ancient Maya (Thomas 2007). The ancient Maya had a relational view of personhood that extended beyond corporeal death, not one that acknowledged a Western autonomous individual (Thomas 2007:212). Projecting our concept of the Western individual onto Maya bioarchaeological data undoubtedly skews our interpretations of their mortuary ritual, particularly when it comes to secondary burial and manipulation of skeletal remains. Second, Hodder (1982a, 1982b) and Miller and Tilley (1984) established a conceptual framework through which material culture is rendered useful for reconstructing belief systems. Hodder's (1982a, 1982b) focus upon symbols and meaning is especially relevant and I argue that the symbolic significance of human bone in Maya mortuary ritual should be explored.

Closer attention to the placement of ancient Maya human remains in grave contexts, coupled with accurate use of cultural categories such as religion and worldview will bring scholars closer to deciphering the meaning behind the complex Maya mortuary record. Using data on the decomposition processes of the human body will provide important evidential constraints to the existing corpus of literature on ancestor veneration practices. Finally, post-processualists argue for historically and culturally contextualized data. Maya burial practices have been shown to vary across time and through space. Close attention to historical changes or continuity in terms of ancestor veneration practices should be explored.

Complexities of the Ancient Maya Mortuary Record

The ancient Maya mortuary record is discussed in some detail in the research expectations laid out in Chapter 4, as well as its underlying worldview in Chapter 2. However, it is necessary to link the theory outlined above to the Maya mortuary record, which is notoriously complex. As previously mentioned, the ancient Maya did not create cemeteries and so human interments are found in a variety of architectural locations (Ruz 1968; Welsh 1988). In addition, the archaeological record consistently shows that the deceased body was the subject of a diversity of treatments. For example, archaeologists have recovered complex deposits within graves of multiple individuals in various states of articulation or disarticulation, recovery of human bone in non-funerary contexts such as trash middens or stairwells, recovery of human bone and teeth in ritual non-funerary ritual contexts like caches or “problematical deposits”, recovery of deposits of human skulls, and even empty grave contexts (Barrett and Scherer 2005; Chase and Chase 1994;

Chase 1998; Duncan 2005, 2011; Duncan and Schwartz 2014; Hammond et al. 1975; McAnany et al. 1999; Tiesler 2004, 2007; Tiesler et al. 2010; Weiss Krejci 2003: Welsh 1988).

Early in the history of ancient Maya mortuary analyses, scholars pointed to the tradition of human sacrifice as an explanation for these complex funerary and non-funerary features (Ruz 1968; Robin 1989; Welsh 1988). For Welsh (1988:168) a sacrificial victim was identified by their placement in a multiple individual interment. No osteological data, such as cutmarks, element inventories, age or sex profiles, or degree of articulation, was marshaled to support an interpretation of sacrifice. This lack of contextual data has since been challenged (Weiss-Krejci 2001, 2003, 2004; Tiesler 2007).

McAnany's (2013[1995]) scholarship on the institution of ancestor veneration among the ancient Maya proposed that extended mortuary treatment over long periods of time was one explanation for complex, multiple individual deposits. In short, illustrious forebears would be interred in close proximity often marked by a temple pyramid, or together in a common grave. Their burial within a residential unit gave their descendants first rights to adjoining land and resources. Exhuming of skeletal elements for display and curation was afurther step in the ancestral mortuary rite. However, these actions – comminging of skeletal remains and removal of certain elements for display – could be the product of a variety of processes. As summarized by Weiss-Krejci (2003:356) a number of specific processes have been proposesed in recent scholarship that lead to these complex deposits including, " . . . bodyprocessing, storage, exhumation and collective reburial, caching of tomb contents, looting and desecration, ritual use of human bones, disturbance of bones, sequential interments in collective crypts and caves, as well

as rites of tomb re-entry." It remains difficult to distinguish between some of these processes, however, in the archaeological record. Duncan's (2005, 2011) work on distinguishing veneration vs. desecration in mortuary treatment is a good example of the types of data collection and scrutiny needed to interpret complex mortuary assemblages.

Duncan (2005) discovered a series of pits containing rows and pairs of skulls as well as a pit of postcranial remains all within a temple complex dating the Postclassic period in the Petén lakes region of modern day Guatemala. As described in Chapter 2, the head in ancient Maya worldview was associated metaphorically with the entire body and represented the individual's destiny (Houston et al. 1996:68). Life essences resided, in part, in the head and could be acquired by another if this part of the body was captured. The head was also associated with maize and the cycles of regeneration (Carlsen and Prechtel 1991). How to discern if the intention behind the creation of the skull pits was an act of veneration of individuals who were powerful during life as ancestors or as acts of desecration or humiliation as part of warfare?

Duncan (2005) considered multiple lines of archaeological, osteological, and taphonomic evidence to deduce that the postcrania and skulls were likely captured during warfare and sacrificed. The skulls, where data was available, were determined to have been male or possibly male, and were late adolescent to young adult in age. The skulls did not have cutmarks to support a conclusion of decapitation but the sets of postcrania did have cutmarks near joints in the distal 1/3 of the diaphyses suggesting at least partial dismemberment. Duncan's interpretation of these deposits was that they were not evidence of ancestral veneration but were in fact war captives that were likely sacrificed as dedicatory offerings in the temple. The broader cultural context of the rivalry between

neighboring groups in the Postclassic Petén region further supports this interpretation (Duncan 2011: 564-567).

The point of this brief discussion is to bridge the broader theoretical orientation given in the preceding section that calls for historically and culturally contextualized, but empirically based, bioarchaeological analyses, with the following, a description of *anthropologie de terrain*, an approach that has proven useful for teasing out the complex processes that produced the mortuary record of the ancient Maya. In the next section, the method of archaeothanatology is described and examples are provided of its use in complex mortuary contexts. Archaeothanatology, coupled with recosntructions of ancient Maya worldview, are crucial for more accurate interpretations of ancient Maya mortuary ritual.

Anthropologie de terrain (Archaeothanatology)

In a recent review of current mortuary studies, Lynne Goldstein (2006) concluded that while significant advances have been made in both physical anthropology and archaeology over the past 20 years, their juxtaposition in the study of mortuary behavior has not been as productive as it could be. Many studies that use taphonomic data collection strategies, like the French approach *Anthropologie de terrain*, aim to address Goldstein's timely criticism (Nilsson-Stutz 2006, 2003b; see also Dirkmaat et al. 2008 for a similar perspective from forensic anthropology). *Anthropologie de terrain* is used in this study to address the expectation that mid-level leaders of the Belize Valley entered into relationships with their ancestors through interaction with their skeletal remains.

The general problem domain of *anthropologie de terrain* is identifying the results of human intentions and differentiating them from those of natural processes within a grave context (Duday 2006:32-33; Roksandic 2002:100). Thus it is seen as particularly relevant to understanding in what ways living Maya interacted with the bones of their ancestors. Some intentional behaviors that are readily addressed include the following: reconstructing the details of discrete mortuary practices such as the use of biers, coffins, shrouds, ropes or other features that decompose and would not otherwise be evident (Duday, Lambach and Plouin 1990; Pereira1999; Pereira and Michelet 2004; Willis and Tayles 2009); documenting extended or multi-stage mortuary rituals for a single person or a suite of people (Nilsson-Stutz 2003a, 2003b; Pereira 1999; Nelson 1998; Saul and Saul 2002; Tiesler 2007; Tiesler and Campaña 2006; Tiesler et al. 2010); distinguishing distinct tracks of a multi-track mortuary program (Pereira 1999); and inferring whether the corpse was transported a long distance from the place of death to the place of burial (Boddington 1987). The following sections review the studies just cited and others that have used mortuary taphonomy, and specifically osteological data, for the above purposes. I then discuss some broader anthropological topics that can be investigated with the inferred, intentional behaviors.

Anthropologie de terrain, or archaeothanatology, is a methodology that was developed by French archaeologists to rectify what Duday (2006:30) describes as a "flagrant epistemological aberration" - that archaeological excavation and interpretation of human burial contexts do not take into account the corpse itself, beyond standard demographic information like age and sex. The ultimate goal of the method is to identify the human intentions behind mortuary deposits by reconstructing the original burial

context and its history (Roksandic 2002:101). This goal is met by taking into account the ways in which both cultural and biological processes transform mortuary contexts, specifically through analysis of sequences of decomposition and decay of the human body within a specific ecological context. In actuality, *anthropologie de terrain* is one tool of the broader method of taphonomy. Taphonomy is an analytical paradigm that developed in the fields of paleontology (Efremov 1940) and zooarchaeology (Gifford 1981). Ann Stodder, in a recent review of taphonomic studies, explains the utility of taphonomic research as providing "the framework in which we can investigate the multiple processes and events that cumulatively determine the content and condition of skeletal assemblages from archaeological sites" (Stodder 2008:71). Examples of such processes include decomposition, bioturbation, carnivore scavenging, insect boring, etc. In her work, Stodder emphasizes that taphonomic studies involve data on the remains themselves and the depositional contexts of the remains (Stodder 2008:71). Taking into account the entire history of a skeletal assemblage is necessary to interpret it and reconstruct the death rituals of prehistoric peoples.

Archaeothanatology draws its method and interpretation from the related disciplines of archaeology, taphonomy, and forensic anthropology (Duday 2006; Gifford 1981; Schiffer 1987; Nilsson Stutz 2003b; Roksandic 2002; Tiesler 2004, 2007). The taphonomic approach, originally developed to interpret the formation processes of paleontological contexts (Efremov 1940:93), was first applied to mortuary archaeology by European archaeologists studying complex, multiple-individual interments dating to the Neolithic era (Leroi-Gourhan et al. 1962; see also Roksandic 2002:100). These developments occurred in parallel to the use of taphonomic principles in interpreting

bone and lithic spatial distributions within meticulously piece-plotted habitation sites in Europe and Africa (e.g. Leroi-Gourhan and Brezillon 1966). More recently, French archaeologist Henri Duday (2006; see also Duday et al. 1990; Duday and Masset 1987) and colleagues have focused their research on the precise documentation of each skeletal element in a grave context to distinguish natural taphonomic effects from ritual activity. In turn, forensic anthropology continues to contribute to our understanding of the ways in which the burial environment (e.g., temperature, depth below the surface, exposure to air and soil acidity) affects human decomposition (Boddington et al. 1987; Haglund and Sorg 2002; Mant 1987; Rodriguez and Bass 1985; Sledzik 1998). The importance of a physical anthropologist horoughly documentating the position of every skeletal element during excavation is emphasized (Duday 2006:30).

Archaeothanatology addresses the nature of the burial (primary or secondary), the space of decomposition (open or filled), the presence of grave furniture (i.e., shrouds, biers, or coffins, and other grave goods), and, if there are multiple individuals in one grave, the relative chronology of their deposition (Duday 2006; see also Duday et al. 1990; Nilsson Stutz 2003b, 2006; Roksandic 2002). Reconstructing these aspects of mortuary variability relies on the extent to which skeletal elements may have moved after initial deposition of the body, given the state of articulation of the joints at discovery. Two aspects of anatomy are considered crucial to such inferences (Roksandic 2002:103-104). First is the degree of movement possible within a joint (e.g. the shoulder joint moves on multiple axes whereas the joint of the elbow can only move on two axes and the cranial sutures are essentially immobile). Weaker, or labile, articulations, including the cervical vertebrae, bones of the hands and feet, costosternal joints, and the

scapulothoracic junction, become disarticulated sooner than stronger, or persistent, articulations. Persistent articulations include the lumbar vertebrae and sacrum, the femora and the ilia, and the tarsals (Duday 2006). Weaker articulations are sometimes, but not in all cases, surrounded by less soft tissue and/or by ligaments that are less strong than other joints. Because ligament strength varies among individuals, the rate of joint disarticulation is highly specific to the individual and to the microenvironment of the grave. Labile joints are often closer to the skin surface (e.g. the bones of the hand), so they are vulnerable to infiltration by insects, which may expedite disarticulation.

Second, the extent to which skeletal element(s) could have moved and the degree of articulation of a skeleton depend on how stable the position of the body was at the time of deposition (Roksandic 2002:103-104). One key factor is whether the space surrounding the body was left open or filled with soil before or during the decomposition process. Greater freedom of bone movement is expected, due to the effects of gravity, if a body is placed in an open space, whereas soil or a container will restrict movement of skeletal elements (Duday 2006). Decomposition in an open space is indicated for burials laid in an extended, supine position by the opening of the pubic symphysis, lateral expansion of the iliac blades, and lateral movement of the bones of the leg, including the patella (Duday 2006; see also Nilsson Stutz 2003b:255). These indicators are combined with details of the immediate grave context to differentiate between intentional human behavior and other possible taphonomic agents that could have produced the observed arrangement of skeletal elements (Roksandic 2002:101). Relevant contextual parameters include the general climate of the grave location, the type of soil in which the body is interred, depth of interment, presence of a container such as a coffin or a shroud, clothing

worn by the deceased, and the amount of water and oxygen that can infiltrate the grave space given grave construction and disintegration (Garland and Janaway 1989; Mant 1987; Micozzi 1991; Nawrocki 1995; Sledzik 1998).

Ideally, a physical anthropologist ("field" anthropologist, as described by Duday 2006) would be present to excavate and document the position of each skeletal element and their association with each other and other objects in the grave space. In the event that this ideal situation cannot be met, field notes, drawings, and photographs can be used. Recently, scholars have successfully applied the method using photographs and scale drawings of previously excavated skeletal remains (Willis and Tayles 2009, Nilsson-Stutz 2003b, Pereira 1999). If the excavation records and photos of the burials are superb, then the relevant information can be gathered.

An example of a most basic use of *anthropologie de terrain* to reconstruct an intentional behavior otherwise not directly detectable in the mortuary context is Gregory Pereira's (1999) study of collective tombs at the site of La Loma in Michoacan, Mexico. For several cases of seated interments, Pereira found that the cervical vertebrae were consistently disarticulated at C6. Typically, the cervical vertebrae will disarticulate at the C2/C3 intervertebral joint because the more caudal cervical vertebrae have more labile articulations. Pereira interpreted these data to indicate that a cord or rope was wrapped around the neck of the deceased. Images from the Aztec codices clearly show human bodies, presumably deceased, in a flexed position wrapped in fabric that is tied at the throat. Pereira also found taphonomic evidence for bodies having been wrapped in perishable, semi-rigid material like reed mats (1999:9).

A more elaborate instance of reconstructing an unobvious detail of mortuary rites is Pereira and Michelet's (2004) documentation of a funerary bier within the tomb of an ancient Maya king at the site of Balamku, Campeche, Mexico (Pereira and Michelet 2004). The remains of a single complete skeleton were found dispersed throughout the tomb, with many elements resting within the dozens of ceramic vessels that covered the floor of the tomb. While articulations were maintained only in three parts of the body (Pereira and Michelet 2004:337), the elements were in correct anatomical position relative to one another. The disarticulated nature of the body might prompt some investigators to categorize this burial as secondary. Pereira and Michelet, however, argued that the individual was interred on a funerary bier. The bier collapsed before the body had completely skeletonized such that some of the major joints of the body (hip, knee) were maintained while the rest of the elements were scattered into the vessels below. In a review of literature on ancient Maya burials, Pereira and Michelet (2004:346) found that interring bodies on funerary biers was a tradition of the Early Classic period that may have originated in the Maya highlands and that did not endure to the Late Classic period. These authors clearly show that investigations of human taphonomy are integral for understanding ritual practices.

A second, and rich, example of the utility of the *anthropologie de terrain* method in documenting a depositional trajectory over an extended mortuary sequence is a study of Tiesler's (2007; Tiesler and Campaña 2006). She made a detailed analysis of a complex deposit from the Maya site of Becán, Campeche, Mexico, inferring a series of events and their cultural foundations. The semi-complete and semi-articulated body of a young adult, probably male, was found within a passageway at the base of a staircase

outside the entrance to a chamber beneath a large temple. The seemingly haphazard placement of the individual at the base of the stairs could have indicated a rushed or opportunistic disposal of a body. Meticulous examination of the skeletal remains and their architectural and cultural contexts revealed a more complex mortuary process. The body had been laid upon a bed of chert flakes, a treatment seen in some royal burials in the Maya area (Fitzsimmons 2009). The feet remained in articulation, indicating that the body decomposed in situ. However, the long bones and skull were not recovered with the rest of the body. These are some of the most robust bones in the body, and the most plausible explanation for their absence is that the passage was re-entered and the bones removed at some point after decomposition had begun. Cut marks, made to fresh bone, were observed on several ribs and vertebrae. The pattern of cut marks was interpreted as indicating heart extraction, a ritual associated with human sacrifice among the ancient Maya. Tiesler thus interpreted this deposit as a sacrificial victim, whose remains were revisited later in time, importantly revealing that practices usually thought to be reserved for ancestors, like re-visitation, occurred in other instances as well. The implication of this unanticipated treatment for ancient Mayan politics and religion has yet to be fully explored.

Tielser and colleagues (2010) drew on taphonomic, forensic, and archaeological evidence also to interpret a complex, multiple individual funerary deposit from the Late Classic period Maya site of Xuenkal, Yucatán, Mexico. At Xuenkal, four graves, three cists, and one crypt were encountered within a long, low platform (a “range”) of residential function. A single grave enclosure surrounded the three cists (Tiesler et al. 2010:366.) Careful field excavation included precise plotting of the spatial location for

each skeletal element within the graves as well as data on the depth, orientation, degree of skeletal articulation, and taphonomic conditions of each element (n = 369). Each grave context contained at least two individuals–a primary interment and a deposit of disturbed or incomplete skeletons that were secondary interments or remnants of primary burials from which elements had been taken. The minimum number of individuals from this deposit was eighteen. Interestingly, the bodies placed in this grave context showed a variety of postmortem treatments identified with the aid of carefully collected taphonomic data. Several individuals were left in open space to decompose, while the graves of others were filled in before decomposition. The bones of at least two young adults were moved within the grave space; in both cases, lower extremities found at one end of the grave matched the osteological maturity of the upper part of the skeleton found at a different stratigraphic level. A tooth found with one set of postcranial remains confirmed that these remains belonged to those of a skull that was found in a plate associated with another individual (Tiesler et al. 2010:370). Individuals of both sexes and all ages were represented in the deposit, although men represented the majority. Individuals were placed in this space continually for decades, if not centuries. Tiesler and her colleagues suggest that the extended mortuary treatments and the duration of time over which the grave space was used indicate that the memory of the deceased through ancestor veneration practices was likely the cultural motivation for the creation of this deposit. While these practices are recognized elsewhere in the Maya area, the deposit at Xuenkal was the first example of extended mortuary ritual in the Northern Yucatán (Tiesler et al. 2010:377). The authors also used strontium isotope values to further explore the individuals in the deposit. Based on radiogenic strontium isotope values, the

authors inferred that, despite variation in mortuary treatment, all individuals were likely locally born (Tiesler et al. 2010). The one exception was a mask made from a human skull of a male individual whose likely origin was the southern Maya lowlands (Tiesler et al. 2010:375).

While it is ideal to excavate human remains according to *anthropologie de terrain* principles, high quality excavation records make it possible to review previously excavated skeletal series and thus provide new interpretations. Tiesler and colleagues (2013) took this approach to Ossuary I from El Zapotal located in south-central Veracruz, Mexico that dates to the Late Classic period (A.D. 1000). They addressed a debate regarding use and termination of the shrine. The Ossuary is located within a ceremonial center dedicated to a life-sized, richly ornamented skeleton rendered from clay, interpreted as the god of death. The discovery of terra-cotta figurines called *cihuateteos*, representing the deity associated with women who died in childbirth, prompted the initial interpretation that the shrine and extensive skeletal remains were dedicated to those who did not survive childbirth. Ossuary I, described as "a column of bones" (Tiesler et al. 2013:50) contained about 200 individuals, some partially articulated. A reassessment of the archaeological data showed that Ossuary I was in fact an earthen circular shaft that was gradually filled with remains over an extended period of time and could not have been associated with the death god shrine, as the pit was dug through building fill placed after the termination of the death god shrine. (Tiesler et al. 2013:50-51). Taphonomic data including degree of preservation, surface color, and postmortem manipulation, element presence, and a reassessment of the assemblage's demographics show an evolving ritual program at the shrine. Color and preservation alterations of the bone

surfaces indicate that there were successive interments. Earlier deposits consisted of men and women who had been flayed prior to decomposition, a practice previously unrecognized in the archaeological record of the region, while stratigraphically recent levels contained only female crania who received no posthumous treatment (Tiesler et al. 2013:65). Further, individuals of the earlier time period showed a type of cranial modification considered local to the El Zapotal area. Females from the later deposits did not show this same cranial modification style, which could indicate change in preference or that the females were not local to the region. Partruition scars on the female pelves lend support to the initial interpretation that the women may have died in childbirth (Tielser et al. 2013:66).

Extended mortuary programs with more than one "track" (Brown 1981:36) can also be identified using principles of *anthropologie de terrain* at the burial population level of analysis, Gregory Pereira (1999) discovered two mortuary tracks in a collective tomb at the site of La Loma in Michoacan, Mexico. The tomb held primary and secondary burials. Pereira found that the smallest skeletal elements of the secondary burials were grouped near funerary offerings and the long bones and crania were placed in another part of the tomb. He hypothesized that the bodies were deposited in the tomb when they were still fleshed and then moved to another location within the tomb after decomposition was nearly complete. Pereira also argued that two types of secondary interments were deposited in the collective tomb, selective and non-selective deposits based on which bones were recovered from an individual. Selective deposits consisted of the tibia and femora from an individual and non-selective deposits contained all the long

bones from an individual. This distinction was corroborated when an age pattern emerged: all selective secondary burials were children.

Extended mortuary rituals for multiple, sequentially deceased persons, in contrast to extended treatment of a single individual, have also been reconstructed using *anthropologie de terrain*. Saul and Saul (2002) combined forensic and archaeological data to investigate the sequence of deposition of a multiple-individual deposit in the Maya Mountains of Belize. The interment consisted of three burials – a male, a female, and an infant – within the same rock shelter. The male and female were articulated and seem to have been in a primary position. The remains of the juvenile were found scattered around the grave. The authors used osteological data to address whether or not the juvenile had been dismembered or decapitated before burial (Saul and Saul 2002:75). The authors observed that the first and second cervical vertebrae were in a position that would have been impossible in a fleshed body. Furthermore, the left radius and ulna, bones of the forearm, were found in close proximity but in an incorrect anatomical position, with the distal end of one bone pointing north and the distal end of the other bones pointing south – also impossible in a fleshed body (Saul and Saul 2002:75). The authors concluded that the body of the juvenile was already significantly decomposed when placed in the rock shelter. Based on stratigraphic associations, their reconstruction of events proposed that the juvenile died first and was interred elsewhere. The male died next and the juvenile was brought from its initial grave and placed with the man. The female was the last to be interred in this location, over the remains of the male and the child. Saul and Saul suggested that the three were members of the same family who died sequentially, but close in time and thus were buried together.

Recent work from the Río Bec region highlights possible variation in the materialization of ancestors. Río Bec is an ancient Maya site that is located in the southern Yucatán peninsula of Mexico. Recent analyses of the Río Bec region suggest that sites there also experienced a degree of autonomy from powerful cities that oversaw the central Lowlands in the Late Classic. Río Bec itself seems to not have a center organized around public space implying a lack of centralized political power (Pereira 2013:449; Michelet et al 2010; Nodédéo et al 2013). Furthermore, while the residential architecture was elaborate, consisting of vaulted rooms, stone masonry, and towers, there were no royal tombs or clear central place. Over eight years of excavating the Río Bec project recovered a mere 18 burials, all from residential contexts. The excavators interpret this pattern as evidence that residential interment may have been a privilege not afforded to all the deceased (Pereira 2013:450). All burials were generally similar, a single individual placed in a simple pit with a few grave goods (Pereira 2013:453). They were all adult individuals and the assemblage was predominantly male. Pereira (see also Michelet et al. 2010) divides the group of burials into two types - "transition" burials, placed during structure modification, and "occupation" burials, placed when the building was still occupied. The two types differed with respect to body position and grave type; the transition burials were seated within a pit dug into sterile or bedrock and the grave space was not filled in with soil, and the occupation burials were flexed on their right or left side in a bell-shaped pit which was filled with soil. The seated position is not commonly observed in the Maya region and is associated with authority (McAnany 2013[1995]) Pereira 2013:455-456). The two types of interments are also distinguished by their placement within the buildings. The transition burials were placed on the axis of

the newly refurbished building, possibly setting the new axis by their location. The occupation burials were placed lateral to the central axis of the building (Pereira 2013:458). The burial assemblage is consistent with McAnany's model for ancestors, that the assemblage show a bias for age or sex, individuals distinguished by specific placement or practices, and enduring importance of location where remains were placed (Pereira 2013:462). Drawing on settlement pattern and artifactual data from throughout the Río Bec region, Peirera states that there was a sociopolitical rupture in the region between the Early Classic and beginning of the Late Classic era wherein Petén-style architecture is abandoned and the distinct Río Bec style architecture predominates, and settlement becomes dispersed. He argues that the type and style of ancestor veneration may have changed, as well. Perhaps the public veneration of ancestors and showing social status through funerary elaboration was also abandoned in favor of private veneration. The act of private veneration may have, " . . . served as an effective mechanism for resisting the centralization of power and its concentration in the hands of a single lineage with royal ambitions" (Pereira 2013:464). This example is important because it demonstrates that body positioning and treatment were likely regionally specific factors and the mortuary treatment was a specific part of culture that communicated something. It also carries forward the ideas put forth by McAnany and suggests that the style of ancestor veneration differed by region and was linked, as McAnany argued, to matters of landscape, residences, continuity, and economy.

Radiocarbon dating

Radiocarbon dating was used to assess the timing and frequency of interments within multiple individual burials. Radiocarbon dating uses the ratio of radioactive ^{14}C,

and its known half-life, to ^{12}C to measure the age of artifacts of biological origin (Libby et al. 1949; Libbey1960; Bronk Ramsey 2008). Put simply, cosmic rays produce secondary neutrons in the upper atmostphere, which collide with ^{14}N and are transformed into the radioactive isotope ^{14}C (Libbey et al. 1949; Libbey 1964:593). Carbon-14 combines with O and is oxidized to $^{14}CO_2$, at which point it is incorporated into plants through photosynthesis and into humans and animals when they ingest plants. Radiocarbon experiences radioactive decay at a known rate; the half-life is about 5730 years (Anderson and Libby 1951; Goodwin 1962). When an organism dies the amount ^{12}C, which is much more abundant in living organisms, remains constant in the tissues but ^{14}C decays and is not replaced. Measuring the ratio of $^{12}C/^{14}C$ and comparing that to the abundance of the isotopes in living organisms, which is very consistent over time, provides the date of an object (Bronk Ramsey 2008:). The ratio of $^{12}C/^{14}C$ is also compared to the ration of $^{13}C/^{12}C$ to assess mass-dependent fractionation (Bronk Ramsey 2008:259). Fractionation results in a decrease in abundance of an isotope which ocurrs during incorporation into living tissues. There will be a difference in the amount of ^{14}C in a human than in a plant, or in the atmosphere.

Measurement of radiocarbon is typically done using an accelerator mass spectrometry (AMS), which is more precise than the alternative method, radiometric dating. AMS methods count the ^{14}C atoms present in the sample directly, as opposed to the decay counting method, which counts the beta particles produced by decay of ^{14}C (Bronk Ramsey 2008:258). AMS dating also requires less carbon, which is advantageous for archaeologists as it can be done on smaller samples (Bronk Ramsey 2008:258).

AMS provides a measurement of the amount of radiocarbon in a sample that must be interpreted, firstly, with respect to the sources of carbon, and second, within the past environmental context of the sample. Humans taken in radiocarbon through ingesting food, whose radiocarbon content can vary based on local differences. Marine life has a different radiocarbon concentration, as well, so different dietery components should be assessed isotopically as necessary (Bronk Ramsey 2008:260).

Secondly, The concentration of radiocarbon in the atmosphere fluctuates over time due to geologic processes, like volcanic eruption or changes in the geomagnetism of the earth, and anthropogenic factors, like burning fossil fuels and nuclear testing. These fluctuations must be accounted for in order to accurately interpret the $^{12}C/^{14}C$ ratio. Sample calibration compares the $^{12}C/^{14}C$ ratio with the results to other ^{14}C samples of known age, for example series of tree ring dates. There have been a number of these calibration curves produced and the one used for this research is OxCal v. 4 (Bronk Ramsey 2009). Calibration provides a range of dates and calculates the statistical probability that your sample date falls with that range Bronk Ramsey 1994, 1995, 2001).

Other possible confounding factors for radiocarbon dating include contamination and reservoir effects (Bronk Ramsey 2008). Contamination can occur at any point after the death of the organism and consists of ^{14}C from another organism becoming mixed with the material that one wishes to date, potentially obscuring the results. Reservoir effects refer to carbon that has been introduced into a sample by the ocean, which as different radiocarbon content than the atmosphere (Bronk Ramsey 2008:252). Reservoir effects are not expected to be a significant problem in this study.

Human teeth were selected for radiocarbon dating (Spalding et al. 2005). Teeth are advantageous because they preserve relatively well in the Maya area and are resistant, but not impervious, to contamination. In addition, once formed there is no turnover so no additional carbon can be incorporated in to the tissue. Teeth are also good for archaeological dating because they are typically collected from secure archaeological contexts. That is, they were taken directly from the skeleton and do not represent another individual potentially from a much different time period (Ramsey 2008:263). Details of sample selection and analysis are given in Chapter 8.

Conclusion

In conclusion, the number of bioarchaeologists incorporating *anthropologie de terrain* principles into their analytical approach has steadily increased in recent years. Recent case studies have effectively used the *anthropologie de terrain* method to enhance understandings of mortuary behavior and its variation across cultures, particularly treatment of individual bodies. Such studies will continue to advance reconstructions of past belief systems and social organization. A next step for bioarchaeologists is to move beyond case studies to problem-oriented and question-driven broader research initiatives. Furthermore, as Tiesler and colleagues (2010, 2013) show, combining *anthropologie de terrain* analyses with other lines of evidence further elucidates the intentions behind mortuary treatment. In this study, the *anthropologie de terrain* approach will be combined with biodistance and bone biogeochemistry analyses as well as assessment of the grave location and contents to construct a comprehensive picture of mortuary treatment of ancestors.

Biodistance

Biodistance is used to assess Expectation 3 - that those interred in eastern structures were more closely related to each other than to those interred in other locations. The section begins by relating a brief history of studies of human biological variation. Second, I review basic population genetic theory upon which biodistance analyses are founded and outline the assumptions made by bioarchaeologists when applying population genetics to ancient skeletal series. I then discuss the biology of tooth development in the third part, including current knowledge of the genetics that influence tooth size and shape. Then I move into a discussion of studies of population variation in the Americas, with particular attention to dental studies, as this dissertation uses only that type of data. Finally, I contextualize my research in light of previous studies of ancient Maya biodistance.

Developments in the Study of Human Biological Variation

Categorizing humans based on a combination of cultural and physical traits drove the study of human variation from the 1700's until the early 20th century, although some studies carried on the practice into the 1960's (Marks 1995:52). Previous to the 1700's, humans were perceived as God's special creation and fundamentally separate from the animal world. Creation events, attributed to divine power, were considered unknowable to man and physical and cultural differences were perceived of as the will of God. Physical inferences were permanent and change only occurred in a linear fashion. The Enlightenment provided space for scientific thinking unconstrained by religion. Two scholars are responsible for conceiving of humans as a part of nature alongside animals,

Carolus Linneaus and George-Louis Leclerc, the Count de Buffon. Linneaus recognized nature as organized, not linearly but in a nested hierarchical order. His scholarship classified living humans into four categories based on appearance, behavior, and personality (Marks 1995:50). While his organizing scheme was a significant contribution and is still used today, he continued to perceive of humanity as composed of static types. Working contemporaneously, Leclerc proposed that, while species did not change, environmental changes could contribute to change within species. Leclerc's major contribution was that his thinking sought an understanding of the process by which diversity was created, which Linneaus' lacked (Marks 1995:9, 49). Linneaus' school of thought took precedence and classification and typology of physical differences became the research agenda of physical anthropologists for about 150 years. Their emphasis on classification validated the underlying assumption that biology was a real and reliable way to divide human groups (Marks 1995:52).

There were small advancements in the philosophical approach to studying human physical variation in the late 18th and early 19th century. For example, Blumenbach removed cultural and behavioral traits, although his descriptive system was rooted in geography and Linneaus' typology (Marks 1995:54). He recognized that human variation was continuous and not discrete, but maintained that describing humans by a few physical traits alone would account for most of global variability.

The late 19th century saw huge breakthroughs for the study of human physical variation with the publication of Charles Darwin's theory of evolution published in 1859 and the experiments of Gregor Mendel in 1856 and 1863 (Hartl and Clark 1997:12). Darwin proposed that natural selection, the ability of an organism to survive and

reproduce successfully in its environment due to inherited traits, was the prime evolutionary force. Natural selection results in changes called adaptations that allow better chances of survival in a given environment (Hartl 2000:74; Hartl and Clark 1997:212). Mendel's experiments with pea plants showed that alleles of the same gene separate during the production of gametes, such that when reproduction occurs half maternal and half paternal information is passed to the zygote. During formation of each gamete alleles are interchanged through recombination, producing new genetic combinations. The theory of evolution by natural selection and the discovery of a physical means by which genetic information was transmitted were the tools by which physical anthropologists could explain the processes of human biological differentiation. However, instead of instigating a paradigm shift in physical anthropology these discoveries were used to reinforce the practice of taxonomic classification (Marks 1995). It was decades before evolutionary theory was used to its full capacity in physical anthropology.

By the late 19th century researchers were still aiming to classify human races based on morphological variation, typically using metric and non-metric traits of the skull (Washburn 1951:299). At this time most physical anthropologists conceived of racial traits not only as real, but also as historically permanent; they had not changed since their creation, reminiscent of 18th century worldviews. Anthropomorphic data were collected with the purpose of finding more support for differences between races than for understanding the process by which differences came to be. Just after the turn of the century, Franz Boas' landmark immigrant study used the cephalic index, a popular measurement for delineating race because of its perceived biological stability, to argue

that environment played a role in the shape and size of the human head. He measured the crania of European immigrants and their children to investigate whether a new environmental context, the United States, affected head size. He found significant differences between children born in the United States and those born in Europe, the change in head form increased the longer the mother had resided in the U.S., and there were significant differences in head form between children born in the U.S. and their parents (Boas 1912; 1940). He showed that a morphological trait considered by many scholars to be fixed was in fact plastic with respect to the environment, undermining the day's theory that races could be defined by fixed traits. His study was criticized, not only then but in recent re-analyses, though subsequent assessments showed his conclusions to be sound (Sparks and Jantz 2002; Gravlee et al. 2003a,b).

Early 20th century scientists Ales Hrdlicka and Earnest Hooton took up the investigation of historical process with respect to human cultural and biological variation, particularly with respect to American Indians (Cook 2006). Hrdlicka's focus on the origins of Native Americans in Asia established the shovel shaped incisor as indicative of both Asians and Native Americans, linking these two groups for the first time (Hrdlicka 1920). Earnest Hooton published a monograph on the skeletal remains from Pecos Pueblo, whose approach was interdisciplinary and used statistical analysis, not common at that time. Hooton found considerable variability among the male Pecos crania. However, Hooton maintained a perspective that racial traits were fixed and attempted to group the Pecos people with Northwest Africans (Hooton 1930). Even so, the discipline itself was still in its formative stages and still very descriptive and typological (Cadien et al. 1974). The early 20th century saw developments in statistics, as well, that would be

requisite for moving forward the study of human variation (Fischer 1918; Wright 1930, 1942; see also Boas 1912).

The paradigm shift away from typology and towards investigation of the evolutionary processes that produce variation in human beings came about in the mid 20th century. The transition was heralded by Washburn (1951) as the "New Physical Anthropology", a discipline no longer merely a technique of data collection but one that can describe the processes of evolution. He emphasizes that this is due to genetic inheritance. Importantly, Washburn states that the correct interpretation of genetic data relies on an understanding of history and advocated for close collaboration among all four fields of anthropology (Washburn 1951:299; see also Cadien et al. 1974, Buettner-Janusch 1969; Konigsberg 2006). Washburn's call for interdisciplinary research was similarly made by archaeologists in the 1960's (Binford 1962, 1965, 1968, 1971). It bears mentioning that the type, rather than the population, as the unit of analysis was not purged from physical anthropology until the 1960's as the work of Neumann (1954) and Coon (1965) show. Neumann published a typology of Native American groups based on cranial shape in 1954 and mentored students in refining his typology into the 1970's (Cook 2006; Konigsberg 2006).

These turning points in physical anthropology and archaeology paved the way for bioarchaeology, the contextual analysis of human remains. As bioarchaeology became a focus of study, human skeletal variation was used to answer questions that were anthropological and social in nature. In particular, human biological variation was used to study within group social organization that had been shown ethnohistorically or

ethnographically to be governed by biological kinship. Buikstra (1980) used biodistance analyses of cranial and post-cranial non-metric traits to explore population movement between settlements in the lower Illinois River region dating to the Middle Woodland period. She challenged the assumption that "local groups that share a common cultural tradition show no important or recognizable intergroup biological variability" (Buikstra 1980:288). Her results showed that the three sites sampled appeared distinctly different according to the epigenetic traits. Although genetic drift could have played a role, Buikstra's results suggest that some aspect of social organization prevented people of the same culture and relatively close geographic distance from mating.

Post-marital residence was a topic explored earlier in biodistance analyses. Lane (1970) and Lane and Sublett (1972) used cranial non-metric traits to investigate post-marital residence practices among the Seneca. Iroquois ethnohistory indicates that they likely practices patrilocal residence, which agreed with their biodistance analyses (Lane and Sublett 1972:191). Researchers continued to use biodistance analyses, using cranial and dental metrics and non-metrics, to address social organization, cemetery organization, population movement, and demographic collapse (Alt and Vach 1998; Byrd and Jantz 1994; Konigsberg 1988; Konigsberg and Buikstra 1995; Owsley and Jantz 1978; Droessler 1981; Falk and Corrucini 1982; Harpending and Jenkins 1973; Howell and Kintigh 1996; Tomczak and Powell 2003; Stojanowski 2001, 2003a,b, 2005, 2007; Corruccini and Shimada 2002; Nystrom 2006; Steadman 2001; Tomczak and Powell 2003;Sutter and Verano 2007).

In this study, I use phenotypic traits of human teeth to study whether individuals chosen for interment in locations associated with ancestors, eastern structures of plaza groups, were more closely related to each other than to those interred in other eastern structures. The following sections will relate the population genetic theory behind biodistance studies and address the assumptions bioarchaeologists make when using population genetic theory to study ancient skeletal series.

Biological Basis for Biodistance Studies: Population Genetics and Evolution

Population genetics is the study of naturally occurring genetic differences, polymorphisms, within and between species and how the forces of evolution act on these differences to change a species over time. Every individual has a genotype, their particular set of genes, and a phenotype, the physical expression of that genotype, which is also affected by the environment. Alleles are different forms of the same gene and allele frequencies and their variation within a population are also a focus of population genetics. A genotype is formed by pairs of alleles (Hartl 2000:1-4; Hartl and Clark 1997:1, 33). Populations are defined as groups of individuals that are of the same species, reside in the same geographic area, and in which group members have equal chances of mating and reproducing with other members (Hartl and Clark 1997:71). Of course, geography prevents equal distribution of species members across the landscape, either due to major topographical features like mountain ranges or patchy resource dispersal. Population distribution is also influenced by social preferences. It is within these populations that subpopulations, or local populations, exist and within which adaptation occurs. Random mating is a key concept in population genetics and a complex one,

especially for humans, where reasons for mating are not random (Hartl and Clark 1997:72; 284)

The processes that act on allele frequencies, put simply, are natural selection, random genetic drift, gene flow, and mutation. Natural selection shows that certain traits convey fitness, the likelihood that an organism will be able to reproduce successfully in a given environment. Natural selection works on the individual phenotype and, over time, produces changes in the underlying genotype (Hartl and Clark 1997:211-212). Random genetic drift is the change of allele frequency in a population at random through the process of recombination. Random genetic drift is, thus, sensitive to population size whereby small populations have fewer alleles so changes have a larger effect on the population allele frequencies (Hartl and Clark 1997:267). Larger populations have a greater diversity of alleles so changes have a less dramatic effect on allele frequencies. Sudden decreases in population size, due to emigration, catastrophic events, and geographic isolation have extreme effects on allele frequencies whereby rare traits or diseases can become common in a population (Hartl and Clark 1997:291). Gene flow is the exchange of alleles between populations through mating. Mutation is the introduction of new alleles at random and is the only way for new genetic information to be created (Hartl and Clark 1997:163; Konigsberg 2000; Relethford and Lees 1982).

Quantitative traits are polygenic, meaning their phenotype is governed by more than one gene, but they are governed similarly to monogenic traits (Chakraborty 1990). As discussed by Chakraborty (1990:149), quantitative traits are affected by a more complex process in their expression, including multiple genes and environmental effects.

But, if they are chosen well they can potentially convey more information than single-gene traits (see below for more information on dental genetics). The use of quantitative traits for describing population structure is well established by the study of phenotypic traits among groups of known kinship and population history (Williams-Blangero and Blangero 1989, 1990; Cheverud 1988; see also Relethford and Lees 1982). Quantitative traits used for biodistance analysis include cranial, post-cranial, and dental metric and non-metric skeletal traits (Turner et al. 1991; Hauser and DeStefano 1989; Hartl and Clark 1997:398). The foci of this dissertation are dental metric and non-metric traits.

The study of human variation is now approached from the perspective of population genetic principles and the statistical toolkit includes multivariate statistics that can approach complex questions (Relethford 1996, 2003; Relethford and Lees 1982; Wright 1942; Fischer 1930; Hartl and Clark 1997; Hartl 2000; Konigsberg 1988, 1990). Human biological phenotypic variation remains a useful tool for anthropologists because it can tell us about past population history and structure. Population history refers to the degree of similarity between two groups resulting from gene flow and/or common ancestry, whereas population structure is the balance between gene flow and genetic drift in a population that takes into account the contributing factors of migration, founder effect, and effective population size, among other population genetic parameters (Relethford 1996:29; Harpending and Jenkins 1973:178-179). The importance of understanding population structure and history is that we can understand the evolutionary processes that created observed variation in a group, we can elucidate aspects of social organization in prehistoric groups that otherwise are unknowable, and, finally, biological

relationships between and among groups is crucial for understanding a population's response to physiological stress (Buikstra et al. 1990:6).

Applying Population Genetics to Biodistance Studies of Ancient Populations

Biodistance analyses make five assumptions. First, phenotypic similarity represents a close biological relationship due to increased gene flow or shared common ancestry. Second, phenotypic dissimilarity is the result of genetic drift. Third, gene flow will lead to convergence and obfuscate population relationships. Fourth, biodistance analyses assume that natural selection is neutral. Finally, these analyses assume that environmental effects are randomly distributed across the population under study (Stojanowski and Schillaci 2006:51). Combining good sample selection and methodological approaches, detailed below, can account for some of these assumptions. Additionally, the sample should be assembled so as to represent the living as closely as possible.

Approaches to studying biodistance. Analytical approaches to biodistance are categorized as model-free or model-bound depending on the extent to which the analysis incorporates population genetics parameters. Incorporating these parameters allows researchers to make fewer assumptions about past populations and interpret their data more accurately.

Model-free approaches use biological similarity to assess phenotypic similarity between groups. Gene flow is the primary explanatory mechanism. The more similar the groups compared, the more likely they share a common ancestor or experience persistent gene flow between groups. There are no population genetic parameters used in model-free approaches, thus the relative degree of variation is estimated but no causes of

variation are revealed (Relethford and Lees 1982:116). Model-free approaches assume that drift is random and that migration rates and population size are equivalent for all groups. This approach is more commonly used to address population history. Model-bound approaches use population genetic theory to model evolutionary parameters, such as effective population size, migration rates, and genetic drift. Drift can obscure population history, especially for groups with small or highly variant population sizes (Relethford 1996:31). Model-bound approaches are more commonly used to address population structure. Harpending and Ward's (1982) R matrix model, with updates by Relethford and Blangero (1990), is a widely used model-bound approach. The R matrix model estimates levels of gene flow based on population heterozygosity for a geographic region. While it is appealing that the model-bound approach incorporates parameters that play important roles in biological variation, effective population size and gene flow, for ancient remains these numbers are estimates themselves. Thus, an unknown degree of error is introduced. Use of either approach depends on the question asked; Powell and Neves (1999) suggested using both approaches instead may be a productive model (Scherer 2004:77-78). Results of both analyses can be weighed when coming up with a final interpretation of the data.

Heritability

In common parlance heritability is taken to mean how 'genetic' a certain trait may be. Unfortunately this meaning has been used in some anthropological studies of human biological variability (Vitzthum 2003:546-547), thus it is worth emphasizing the correct meaning here, as it will be used in this dissertation. Heritability is used by anthropologists, " . . . as a guide to the genetic and environmental components of

phenotypic variance" (Scott and Turner 1997:145). Vitzthum (2003:541) defined heritability, "as the proportion of the total phenotypic variance that is associated with genetic variance in a specific sample with specific composition and environmental context." Heritability is thus a description of a population and not a characteristic of a particular individual or trait. Major influences of heritability are gene frequencies within a particular population, diversity of the environment within which that population lives, population size, and time (Scott and Turner 1997:547; Hughes and Townsend 2013:60). For instance, homogeneity in genetic variation or environmental context will produce low heritability estimates (Vitzthum 2003; Scott and Turner 1997). More varied environmental conditions also affect heritability, wherein traits have lower heritability in diverse environments than traits of populations in more homogenous environments (Marks 2002:146-147; Scott and Turner 1997:154; Vitzthum 2003:547). Time plays a role as well; populations will have traits that vary in heritability by generation (Scott and Turner 1997; Vitzthum 2003). Heritability is useful as a measure of evolutionary potential of quantitative traits (Hughes and Townsend 2013:60).

In sum, population genetic theory and its associated multivariate statistical toolkit provide the means by which evolutionary processes can be used to answer questions about past population history and structure. Population history and structure are of interest to bioarchaeologists because they can be used to answer bioarchaeological questions concerning past social organization, responses to physiological stress, and elucidate population level morphological variation. The present study is concerned with reconstructing aspects of past social organization, particularly whether individuals buried in ritually important locations were more closely related to each other than those interred

elsewhere. Quantitative phenotypic traits of the dentition are used to estimate genetic relatedness. Aspects of ancient populations that may be unknown, like effective population size, migration rates, and genetic drift must be assumed to be negligible for ancient populations, although they almost certainly were not. However, these assumptions do not negate the validity of using biodistance in ancient populations (Stojanowski and Schillaci 2006). The following sections will describe in more detail the biology behind dental development and the interplay between genes and the environment.

Dental Development, Genes, and Environment

After fertilization and implantation of a human embryo, rapid cell division occurs resulting in three primary germ cell layers by approximately the second or third week of development, the ectoderm, mesoderm, and endoderm. The ectodermal cells eventually differentiate into the central nervous system, epithelium, and dental enamel. The mesoderm becomes the skeleton, muscles, and dentin. The endodermal cells give rise to the internal organs. Ectomesenchyme is produced by the interaction of mesoderm and ectoderm cells when the neural tube is formed. These cells contribute to the formation of many different structures in the head and neck (Thesleff 2006).

The development of individual teeth proceeds from one primary structure, the dental lamina, a band of epithelial cells within the first branchial arch of embryo development. The epithelial cells lay atop a band of ectomesenchymal cells. In the first stage of dental development, the bud stage, the epithelial cells proliferate and the band thickens. This thickening only occurs at the site where a tooth will eventually develop (Sharpe 2000:5). The thickening of the epithelial band pushes into the ectomesenchyme. Signaling

between the two cell layers is vital for tooth development. The two layers switch off during development, which is responsible for signaling. There are up to 300 genes that have been identified as contributing to tooth development (see below) (Thesleff 2006). As the bud matures, a primary enamel knot is formed at the location of the first, or only, tooth cusp, depending on tooth class. The enamel knot functions as a signaling center, wherein it interacts with surrounding tissues by sending molecular signals that allow morphogenesis to proceed (Jernvall and Thesleff 2000). Its appearance indicates the beginning of tooth shape development. In addition to the enamel knot, the tooth bud epithelial cells produce a 'cap' that grows laterally (Jernvall and Thesleff 2000: 15). The enamel knot itself does not contain cells that continue to proliferate, which probably also contributes to the folding of the inner enamel epithelium (Jernvall and Thesleff 2000:16). The presence of the enamel knot is thought to initiate the folding of the enamel epithelium due to its stationarity among proliferating cells. In multi-cusped teeth, secondary enamel knots form. As development proceeds into the cap stage, the layers of inner enamel epithelium and mesenchymal cells differentiate into ameloblasts, enamel producing cells, and odontoblasts, dentine forming cells. Ameloblasts begin to create enamel moving from the region of the enamel knot, which will be the cusp tip, laterally and down towards the cervico-enamel junction. The inner enamel epithelium divides the ameloblasts and odontoblasts during development.

Aspects of variation in phenotypic expression at many levels in the dentition, within each tooth, between left and right antimeres and upper and lower isomers, between teeth in the same class, between tooth classes, between dentitions, and between individuals, genders, populations, and generations. Quantifying these differences allow

bioarchaeologists to study group affinity (Hughes and Townsend 2013:34-35). In the following sections I relay details of genetic and environmental factors that contribute to variation in dental form.

Genetic Control of Dental Phenotype

Dental size and shape are under genetic control but their expression is also influenced by the environmental context of their development. Mammals are heterodonts, meaning that their teeth differentiate into distinct tooth classes, which, for humans, are incisors, canines, and molars. This differentiation is owed to dietary adaptations (Hillson 1994; Ritz et al. 2008).

Following the work of Huxley and de Beer (1934), Butler (1937, 1939) was the first to apply the theory of morphogenetic fields to teeth to explain why humans have different classes of teeth and the mechanisms for how they develop and evolve. By observing Cenozoic fossil mammal dentition he proposed that teeth are not independent, individual units but that they are parts of a system (1939:22). He proposed that each 'rudiment', or tooth germ, in the dental lamina of the maxilla and mandible contains information that grants them the potential to develop into any of the tooth classes. A substance or "morphogen" specific to a location in the mandible or maxilla, morphogenetic fields, triggers the tooth germ to develop into the appropriate tooth class. In Butler's model, morphogen molecules exist in a gradient with each field. They are strongest at a pole and then diffuse distally, thus determining how many teeth develop within each field. The diffusion of molar morphogens, for instance, is longer than those within the canine field because canine morphogens are concentrated at one pole. Change

could occur on all teeth within one morphogenetic field but each field is evolutionarily independent. For instance, the reduction in size of canines over time did not correspond to a similar reduction in molar size (Butler 1939:3).

Dahlberg (1945) revised the field theory in several ways. First, he classified premolars as their own tooth class. Second, he identified “key” or “polar” teeth (1945:687). The key teeth are the most mesial in their tooth class, with the exception of the mandibular second incisor. They tend to show less variation in size within a population and the highest frequency of non-metric trait expression. The more distal teeth in each class are more likely to be missing and show higher intragroup variability (Scott and Turner 1997:84; Stojanowksi 2001, 2005, 2007; Scott and Aubry 2014).

Osborn (1978:172-173) proposed the “clone” model. He suggested the existence of a primoridum for each class that is not equipotent; that is he proposed that in early stages of dental development each tooth germ does not have the potential to turn into any other tooth. Within each tooth class exists a primordium, or a stem cell precursor derived from mesenchymal cells, that develops first and off of which other primordia are cloned. As each clone is formed a zone of inhibition is formed around it, which delays the formation of subsequent primordia in the tooth class. He suggests that the differences of trait and shape expression within tooth classes are due to a gradient established according to the strength of mesenchymal cells in the developing tooth row. The original primordial in each tooth class undergo more mitotic divisions than other teeth in the class. Thus, the precursor will have the greatest expression of the phenotype while teeth that develop next develop from an “aging” or less potent mesenchyme (Scott and Turner 1997:83; Osborn 1978). This theory is supported by experimental biology data in which researchers

showed that mesenchymal cells from the molars transplanted into anterior dental epithelium lead to the development of molars (Scott and Turner 1997:82-83). It does not provide an explanation for the differentiation between premolars and molars.

Teeth are members of a segmented organ system, meaning that they are members of an organ system that contains members who are morphologically differentiated from each other (Weiss 1993:129). Segmented organ systems include, for example, the three different types of vertebrae, cervical, thoracic, and lumbar. Segmented organ system development is under genetic control of a certain family of homeobox genes called Hox genes.

Homeobox genes contain a region of DNA, which codes for a protein that binds to DNA. Homeoproteins "regulate gene transcription and as such . . . control the expression of genes required for morphogenesis of a particular structure" (Sharpe 2000:4). Hox genes control the order of body parts along the anterior posterior line of the axial skeleton (Sharpe 2000:3-4). The exact role of different Hox genes is still under consideration, but certainly a suite of homeobox genes play important roles in dental morphological development. Hox genes are first found in ectoderm and mesoderm cells during early stages of embryo development. As Hughes and Townsend (2013:36) report, the homeobox model actually fits with the field model of dental differentiation. They agree with previous syntheses of dental development that all three models, field, clone, and homeobox coding, can be integrated into one explanatory scheme (Mitsiadis and Smith 2006; Townsend et al. 2009; Hughes and Townsend 2013).

More is known now about the affects of genes on tooth development and morphology. Over 300 genes are involved in regulating dental development (Thesleff

2006:25-30). These genes are responsible for the timing of gene expression during embryonic development (Sharpe 2000). There is not one gene that produces tooth morphology or size; the genes work in combination to produce an outcome and the most important aspect of their job is determining the location and timing of development (Jernvall and Thesleff 2006). For cusps to become the right size their development has to start at the right moment in embryologic development. Also important is the location in the alveolar bone that tooth development is initiated, because certain Hox genes affect which tooth develops where. There is no evidence that dental traits are the result of natural selection, rather they are assumed to be the result of genetic drift (Scott and Turner 1997:254; but see Mizoguchi 2013).

Environmental Factors Affecting Dental Morphology

The genetic dynamics of human tooth morphology is complex and the exact mode of inheritance is unknown for dental morphological and dental metric traits since they are polygenic (Scott and Turner 1997:136; Keiser 1990). Arguably more important for answering anthropological questions, researchers attempt to suss out the relative contributions of genes and environment to dental morphology and size. Studies of the dentition of families and monozygotic (MZ) twins have been used to assess the contributions of genes and environment to tooth morphology and size (Scott and Turner 1997). MZ twins share a genotype as well as an environment while fraternal twins and siblings share only an environment. These studies have found that heritability estimates for metric and non-metric dental traits range from 0.44 to .80, an important parameter for model-bound approaches (Scott and Turner 1997:157).

As demonstrated by Boas (1912), human physical variation is plastic in expression and can vary according to environmental circumstances. Dental non-metric traits do exhibit asymmetry in expression, suggesting that they are sensitive to some degree to environmental perturbations, however it is unclear in what ways (Scott and Turner 1997). Scott and Alexander (1992) found changes in differences in craniofacial morphology among Norse colonizers of Iceland and Greenland while their dental morphology of crown and root remained more similar to their source population. It remains unclear exactly what factors contribute to dental non-metric changes and to what degree they must be present to cause change. Current work by Mizoguchi (2013:121) investigates metric and non-metric dental traits and their association with physiological biochemical characters like blood groups, Rhesus blood-group system, and lactase activity. He hypothesizes that some of these physiological states are associated with environmental or subsistence practices (i.e. latitude, climate, milk consumption) and the genes that regulate them may also be responsible for dental development to some degree. For instance, UI1 shoveling is positively associated with alleles of the cDE of the Rhesus system, and both have shown high positive correlations with latitude and strong inverse correlations with temperature. Thus, these two phenotypes maybe part of a character complex that was an adaptation to climate and temperature (Mizoguchi 2013:115).

Twin and family studies have shown that environment contributes to changes in size of both deciduous and permanent teeth (Garn et al. 1965; Garn et al. 1979; Goose 1967; Townsend and Brown 1978; Townsend 1980; Townsend et al. 2005; Hughes and Townsend 2013). The complexities of understanding the effects of environment, including health, on dental development are illustrated in data from archaeological

contexts. Cucina and Tiesler (2003, 2004) found that the presence of hypoplasias did not affect the dental metric of that tooth in prehistoric Mesoamerican and Caribbean skeletal samples. Guagliardo (1982) showed that juveniles in a prehistoric skeletal series from the Averbuch site, located in present day Tennessee, had smaller permanent tooth crown size than adults. Guagliardo proposed that the smaller size was due to physiological stress, malnutrition or heightened disease load or a combination of the two that resulted in early death (Guagliardo 1982:387). Stojanowski and colleagues (2005; see also Simpson et al. 1990) found that Native Americans sub-adults from the post-contact era interred at the San Pedro y San Pablo de Patale Spanish Florida missions had significantly smaller teeth than adults. However, at Patale, macroscopic indicators of poor health, linear enamel hypoplasias and non-specific periosteal reactions, were rare. Age-specific tooth size differences were found among individuals at the San Luis de Apalachee mission as well, particularly among the mandibular non-polar teeth. It must be noted that at several missions in the region, an increase in tooth size over time was documented (Stojanowski et al. 2005:216). While the authors concluded that decreased tooth size in children was likely caused by physiological disturbances inherent in the post-contact era, they cannot rule out directional selection for tooth size.

The human dentition has typically gotten smaller with time (Brace 1964, Brace et al. 1991; Calcagno 1989). There are several competing hypotheses to explain the reduction. Calgano (1989) proposes that decrease in posterior tooth size has to do with the transition to agriculture.

In conclusion, while the genetic and environmental influences are not comprehensively understood, it is clear that both play an important role in dental

phenotype. Biodistance studies aim to use phenotypic traits as genetic markers, while taking into account environmental influences. Sample selection can take these factors into account. The following section describes dental variation in the Americas with subsequent sections narrowing in focus to dental variation in Mesoamerica and the Maya region.

Dental Variation in the Americas

Dental anthropology has contributed much to the knowledge of the biological history of Native Americans, although it has been overshadowed in recent years by aDNA data (mitochondrial and autosomal) (Kemp and Shurr 2010; cf Stojanowski et al. 2013). Hrdlicka was the first to suggest Asian origins for Native Americans, supported by data on incisor shoveling (1920, 1921). Hanihara (1968) established that people of East Asia have dental patterns called the Mongoloid complex characterized by high frequencies of shovel shaped incisors, cusp 6, protostylid, and the deflecting wrinkle. He recently refined this system for a global comparison of non-metric traits (Hanihara 2008). Turner identified two patterns within the Mongoloid complex – Sinodonty and Sundadonty (Turner 1983, 1985, 1990). The two types are geographically distinct with, " . . . intensification of traits . . . characteristic of Sinodonty, which occurs in the north. Retention of an older condition and simplification makes up Sundadonty in the south" (Turner 1985:31). Native Americans are typically characterized as Sinodonts with three sub-groupings – American Indian, Greater Northwest Coast Indian (Na-Dene), and Aleut Eskimo. These sub-groups correspond to cultural and linguistic groups (Greenburg et al. 1986) and " . . . are temporally and spatially stable due to limited selection and time for

dental microevolution in the New World" (Turner 1985:31). Turner indicated the region marked by the Altai Mountains and Amur Valley as the Native American source population. Collaborations between dental anthropologists, linguists, and archaeologists produced a model of three-wave migration during the Late Pleistocene across the Bering Land Bridge (Greenburg et al. 1986).

The advancement of aDNA sequencing technology has further clarified the manner in which the Americas were settled (Kemp and Schurr 2010). Native Americans have five mtDNA haplotypes and two Y-chromosome haplotypes that are shared with East Asian people of the Altai and Amur regions of southern Siberia (Dulik et al. 2012; Kitchen et al. 2008; Mulligan et al. 2008; Tamm et al. 2007). Archaeology of Beringia, while scarce, places humans in the region around 30,000 ka (Pitulko et al. 2004). The identification of mutations found throughout the Americas but not present in the Asian subpopulation suggest that ancestral Native Americans resided in Beringia for several thousand years, long enough to accumulate mutations that set them apart from their Asian predecessors (Tamm et al. 2007). Mulligan and colleagues (2008) found that haplotypes are uniformly distributed across the Americas suggesting a rapid and not gradual settling after the ice sheets receded allowing passage. They concluded that the quick migration in the Americas was followed by isolation of local populations within which they developed regional haplotypes (Mulligan et al. 2008:4). This scenario is consistent with archaeology and paleoecological data (Kitchen et al. 2008).

There are no dental data to support specific timing of migration into Central America. Archaeological data for early settlement in Central America is "embarrassingly scarce" due to paucity of evidence or unconvincing data (Dillehay 2008:973). Lohse et

al. (2006:220-221) report that both lanceolate and fishtail points have been found in Belize, although they are all surface finds and without secure dates. Angel and colleagues (1993:13) examined two modern Maya skeletal series from Chiapas, Mexico, and found support for Turner's Sinodonty complex, as had previous studies at Jaina and Chichen Itza in Yucatán , Mexico (see also Pompa y Padilla 1984, 1990). As more data have become available researchers report finding traits consistent with Sundadonty present in South American and Mesoamerican dental morphology (see below, Haydenbilt 1996; Chatters et al. 2014; Powell 1995).

Recent Y-chromosome research on the diversity of the Q haplogroup within Asian and modern Maya groups from the Yucatán and the Guatemalan highlands shows that once Paleoindians arrived in Central America they experienced a rapid population growth, which researchers link to adoption of agriculture (Reguiero et al. 2013:345). The general lack of diversity of haplogroups in Central America points to a severe bottleneck or founder effect in North America that preceded peopling of Central and South America (Reguiero et al. 2013:334).

Ancient Mesoamerican Population Variation

Studies of dental variation in ancient Mesoamerica predominantly focus on elucidating interregional interaction. Haydenbilt's (1996:226-227) assessed 28 morphological traits in 200 individuals from four culture groups to characterize dental morphology in pre-contact Mesoamerica and to compare the variability within and between groups. She finds that none of the groups follow a strict Sinodont/Sundadont pattern (Haydenbilt 1996:239). Her findings are in line with other researchers who, " . . .

have suggested that Paleoindians are biologically distinct from Northeast Asians (Powell 1993) and have found dental heterogeneity among middle Holocene Native Americans (Powell 1995)" (Haydenbilt 1996:243). Thus it is possible that the first people to come into the Americas were more closely related to Sundadonts than previously thought (Haydenbilt 1996:243). The recent discovery of a young woman in a cenote in the eastern Yucatán peninsula dating to the early Holocene revealed that her dental morphology consisted of both Sundadont and Sinodont traits (Chatters et al. 2014).

Christensen (1998) traced the spread of people and Zapotecan language in Oaxaca using cranial non-metric and dental metric traits from about 1500 individuals ranging in location from the highlands to the Pacific coast (Christensen 1998:267-268). He cited linguistic data suggesting that Zapotec languages spread from the central valley of Oaxaca southwest during the Middle and Late Formative periods and to the north and east during the Classic and Postclassic. Archaeological data suggested that sites closer to the coast probably spoke a Zapotecan language, and the earliest sites there were late Middle Formative. Results of the cranial non-metric study showed that none of the samples diverge widely from each other (Christensen 1998:268). Biodistance data show that remains from the western coast are more similar to those from the Early and Middle Formative Valley of Oaxaca than to those from Late Formative Mixteca Alta and Valley of Oaxaca, which is consistent with the linguistic data.

Biodistance has been used at sites where archaeological evidence points to interregional interaction but doubt remains as to the extent of interaction between cultures. Aubrey (2009) investigated whether archaeological evidence for the interregional interaction between central Mexico and the Maya region during the Classic

Period was a cultural connection or whether a biological connection in terms of migration and settlement also occurred (Braswell 2003; Bell et al. 2003). Aubrey found that, " . . . Maya sites that have been identified archaeologically as having a close relationship with Teotihuacan or Tula, also exhibited small pairwise distances comparisons (e.g., Tikál, Kaminaljuyu, Petén, Chichen Itza). A number of these sites also exhibited greater than expected genetic heterozygosity, which would suggest that they were receiving extra-local (i.e. non-Maya) gene flow" (Aubrey 2009:231). He found strong concordance between non-metric and metric data and strong concordance between biological and archaeological models for interaction (Aubrey 2009:231).

New data from modern autosomal and Y-chromosome DNA support dental findings that the Maya were distinct from other Mesoamerican groups (Ibarra Rivera et al. 2008, Reguiero et al. 2013). Ancient DNA is still elusive given the poor preservation of skeletal material in the Maya region (but see Merriweather et al. 1997; Gonzalez-Oliver 2001; Torroni et al. 1992). Biodistance studies have also been a useful tool for understanding population history and structure between sites within the Maya region.

Ancient Maya Regional Population Variation

Cucina and Tielser (2004) demonstrated the usefulness of dental metrics for elucidating population relationships in the greater Maya region. Using cluster analysis, multidimensional scaling, and neighboring joining analyses on five temporally and geographically diverse archaeological skeletal series, they find that dental metric traits are useful for reconstructing biological relationships between Maya communities in Pre-contact and Colonial times (Cucina and Tiesler 2004:18). The results of the neighbor

joining phylogenetic analysis showed two main clusters – one of Classic period and geographically proximate sites of Calakmul and a cluster of sites from the southeast Petén and one of indigenous people from the two contact period locations, Campeche and Tipu (Cucina and Tiesler 2004:15-16). A third Classic period site, Xcambo, did not cluster with the other Classic period sites, which may have been due to greater gene flow due to its role as a trading port (Cucina and Tiesler 2004:18). A control sample from the geographically and temporally distant Dominican Republic Pre-ceramic era was consistently isolated in the analyses, as expected.

Variation within and between sites in the Maya region has also been investigated. Scherer (2004, 2007) found that the Maya region during the Classic period could not be characterized by an isolation by distance model (see Wright 1942; Konigsberg 1990). F_{st} values were all close to zero suggesting that all sites were part of a shared network of gene flow (Scherer 2007:375). The Belize zone itself shows high degrees of heterogeneity (Scherer 2004: 242). Two sites from the Belize Valley and two from northern Belize show low degrees of affinity to each other (Scherer 2004:241). Belize has a diversity of ceramic styles in the Classic period possibly suggesting high rates of extra local interaction (Rice and Forsyth 2004).

Scherer further investigated the relationship between individual sites throughout the Maya region (Scherer 2004, 2007). Of particular interest was the relationship between sites in the central Petén, Tikál and Calakmul, who were often at war according to hieroglyphic inscriptions (Martin and Grube 2008). The scaled R matrix analysis of dental metric data show the sites clustered quite closely, contrary to hypotheses based on epigraphic data. Scherer concluded that the apparent similarity of these large,

heterogeneous sites was due to gene flow with other Maya sites and not with each other (Scherer 2007: 376).

Archaeological data links the sites of Kaminaljuyu, located in the Guatemalan highlands, and Tikál in the Early Classic. Scherer found very little similarity between Kaminaljuyu and all other Maya sites in the sample. The R matrix analysis indicated above average occurrence of extra-local gene flow (Scherer 2007:377). He points out that the lack of association is interesting given that several individuals from the tombs at Kaminaljuyu were supposedly from the Petén, based on iconographic and archaeological data (Valdes and Wright 2004).

Wrobel (2003) used biodistance to study the relationships between sites in northern Belize, and between northern Belize and the rest of the Maya area. Wrobel's aim was to demonstrate how well dental metric and non-metric data could differentiate between geographically (and probably biologically) proximate groups in the Maya area. He intended to model social and biological complexity beginning at the local level and moving to the regional level (2003:8). For some of his analyses it was necessary to lump together temporal groups to increase sample size. He found that in comparisons of non-metric data the sites in northern Belize were closer to each other than to other groups. This indicates that there was probably less gene flow between northern Belize and other regional zones. Northern Belize sites were “moderately” close to Barton Ramie and the farthest from geographically distant Seibal (Wrobel 2003:146). Interestingly, the Late Postclassic group from northern Belize is distinct from earlier groups, according to the metric and non-metric data (Wrobel 2003:146). The Late Postclassic was a time of sociopolitical upheaval that saw an increase in population movement. Wrobel suggested

that the closeness of Northern Belize sites to Barton Ramie could indicate the origins of the gene flow (Wrobel 2003:146).

A number of studies have addressed regional population history in Mesoamerica. Archaeological data suggests population inclusion in the Terminal Classic period of the northwest Petén region of Guatemala, evidenced by changes in ceramic and art style as well as changes in settlement patterns (Sabloff and Willey 1967). Using dental non-metric and metric traits Austin (1970, 1978) found genetic continuity between early and late period Altar de Sacrificios skeletal series and lack of continuity (i.e. greater distance coefficients) between early and late period skeletal series at nearby Seibal (Austin 1978:70). Austin proposes that if Seibal became a regional capital in the Terminal Classic the regime change may have lead to a total change of ruling family and its followers. Altar was subjugated to Seibal and a regime change may not have been warranted. As described above, Seibal was distinct from all other Maya sites in Scherer's (2004, 2007) comprehensive analyses of dental metric and non-metric traits from throughout the Maya area and showed greater than expected extra-local gene flow.

Pre-contact sites from central and coastal Belize were subject of several regional biodistance analyses. Lang (1990) investigated population variation during Postclassic and Historic times at the sites of Lamanai and Tipu, located in north-central and central Belize, respectively. Using dental non-metric traits she found that the Postclassic samples were farther from the Historic era burials. Lang interprets this as a result of population migration from northern Yucatán into Belize during the Colonial period. She also found statistically significant differences in occurrence of shoveling between males and females (Lang 1990).

Walper (1999) addressed population structure in the Postclassic period at Lamanai and at two costal sites, Marco Gonzalez and San Pedro. Walper compared the sites to each other and to samples from Postclassic Lamanai and Historic period Tipu, as well as more geographically distant Seibal and Altar de Sacrificios (Walper 1999:2). Walper could not distinguish Marco Gonzalez and San Pedro based on the traits used indicating they were biologically similar. Marco Gonzalez was biologically distinct from Postclassic Lamanai and Historic period Tipu, although they have ties through material culture to Postclassic Lamanai. Furthermore, a set of temporally early burials at Marco Gonzalez showed morphological similarities to Lamanai (Walper 1999:129-130). San Pedro was distinct from Postclassic Lamanai but not Historic Period Tipu (Walper 1999:130). Finally, she compared Marco and San Pedro to Altar and Seibal using SMMD and found statistically significant biological similarities. Altar and Seibal are geographically distant from Marco Gonzalez and San Pedro, but the coastal sites were likely part of a trading network that may have put them in regular contact with geographically distant sites, as Walper points out (1999:132).

Jacobi (1996, 2000) undertook a comprehensive study of the Historic era cemetery at the Tipu mission, the first dental morphological study of a colonial era skeletal series. The Tipuans were divergent from Late Seibal, Lubaantun, Postclassic Lamanai, Historic Lamanai, and Chichen Itza. Jacobi concludes that, ”The divergence from Lamanai shows that not only were the prehistoric Lamanai different from both the historic Lamanai and historic Tipu, but also the contemporaneous historic Lamanai and Tipuans were different from each other. Lamanai, which is not far from Tipu, probably exhibits more mixing of individuals than does Tipu” (188). These results reflect the Maya sociopolitical reorganization in the Terminal Classic period. They also suggest that historic settlements did not seem to intermix with each other. There was no evidence that the Spanish influenced the gene pool at Tipu (Jacobi 2000:172).

Regional biodistance studies using dental metric and non-metric data show distinctions between geographically and temporally distant groups indicating that the method is useful at a regional level. Important for this study is that the sites in Belize show distinctions between each other spatially and temporally. Previous researchers found data from the Belize Valley difficult to interpret due to its heterogeneity, although it is consistently distinct from northern Belize (Scherer 2004; Wrobel 2003). However, the site of Barton Ramie was the only Belize Valley site used for these analyses. The present study incorporates more data from the Valley than was previously available. Biodistance is also a useful tool for exploring site-specific questions concerning residential history, when well contextualized with archaeological data.

Mesoamerican and Maya Residential History, Socioeconomic Differentiation, and Sacrifice

Rhoads (2002) conducted the first study of dental morphological variation at Copán, located in the southeastern corner of the Maya world. Her overarching research goal was to elucidate social organization and ethnic affiliation in Copán by using dental morphological traits to compare degree of relatedness of individuals buried in patio groups of differing socioeconomic status, as well as of patio groups that were associated with non-local artifacts. Individuals interred in the same patio groups clustered together according to dental metric and morphological traits. She concludes that the patios represent a genetic unit, like a kin based extended family (Rhoads 2002:216). She also finds evidence for two lineages distinguished by tooth size (Rhoads 2002:217). Importantly, she found no differences in degree of relatedness between groups of higher and lower socioeconomic status. She also found that people interred in groups associated with non-Maya artifacts were not likely from a different gene pool.

Serafin (2008) investigated the biological relatedness of groups from distinct burial contexts, Locals (low status), Elite (tombs), and the occupants of a Mass Grave, at the site of Mayapan, located in Yucatán , Mexico. Using dental metric and non-metric traits, he found more heterogeneity at Mayapan than has been reported for the Classic period Maya by Scherer (2007) (Serafin 2008:183). R matrix analysis showed “above average extralocal gene flow” (Serafin 2008:183). Analysis of the residuals values from the Relethford-Blangero R matrix analysis showed that the Mass Grave people are consistently outliers (Serafin 2008:186). Non-metric data distinguished between the Locals and the Elites and Mass Grave occupants. When comparing data types Serafin

finds conflicting evidence, although metric data showed the Mass Grave occupants as the most biologically dissimilar.

Serafin and colleagues (2014) investigate relatedness with respect to burial context at Mayapan. As at many sites in the Maya region, burials were recovered at Mayapan from a variety of locations including graves, temples, plaza floors, chultuns, cenotes, residences, and free-standing ossuaries (Serafin et al. 2014:145). Odontometric analyses showed that individuals interred in the free-standing ossuary structures exhibited more extralocal gene flow than individuals interred elsewhere (Serafin et al. 2014:163). The authors postulated that those interred in the ossuaries are immigrants, or the descendants of immigrants, based on their high levels of gene flow and different mortuary treatment (Serafin et al. 2014:160).

Using non-metric dental data Jacobi identified a suite of rare traits at Tipu, which he used to identify family members interred together (Jacobi 2000:187). Generally, the Tipu population was found to be homogenous (Jacobi 2000:167). Individuals were also homogenous with respect to burial location inside or outside or in different parts of each location with respect to the church (Jacobi 2000:189).

Duncan (2005, 2011) reports two deposits of skulls and post-crania recovered from the site of Ixlu in northern Guatemala dating to the Postclassic period (A.D. 1000-1525). One deposit consisted of six paired skulls located on the east-west axis of a building, while the second deposit consisted of rows of 15 skulls placed at the summit of the same structure. Collections of post-crania were placed perpendicular to these 15 skulls. All individuals were adolescent or young adult males. Duncan identified three individuals with supernumerary teeth. Supernumerary teeth, while not well studied in

Mesoamerica, are generally a rare trait in modern populations. Probability of occurrence in three people who are not related is unlikely. Location of cut marks on the post crania suggests that the individuals were dismembered, but not defleshed (Duncan 2011:561-560). Given an increase in archaeological evidence for warfare in the Postclassic, Duncan interpreted the deposit as sacrificial victims possibly obtained in raiding or battle (Duncan 2011:566).

In conclusion, over the last century, physical anthropology has moved from a merely descriptive discipline with few analytical tools to one that quantifies human variation and how it has changed over time according to evolutionary processes. Cranial metric and non-metric traits were the focus of much of this research in the early days, and still are in some research agendas. Human dentition is an excellent means for studying biological relationships between individuals and groups because their size and morphology are linked to genetics, although environment does play a significant role in their phenotypic expression. Dental data are especially useful to this end in Mesoamerica because preservation of the dentition is generally good even if there is little osseous material preserved.

Biodistance studies in Mesoamerica have been used to elucidate population structure as well as regional population history, and population history of particular sites. The present study uses human biological variation to investigate whether mortuary treatment with respect to ancestors was determined in part by biological relatedness. In addition to addressing this question, the present study contributes new biodistance data, as the only Belize Valley site included in previous studies was Barton Ramie. Continuing excavation has amassed a large skeletal sample as well as excellent contextual data.

Conclusion

A strength of this study is that it combines multiple bioarchaeological methods to assess ancestor veneration among ancient Maya commoners. This chapter elaborated on each type of data collected and showed not only how the method works but made a case for the importance of using the methods in concert. *Anthropologie de terrain* lends a perspective to mortuary analyses that is not fully exploited. The method marries forensic methods and social theories to produce a more detailed picture of ancient death practices. The method is only just beginning to be used the Maya region but shows promise given proper documentation and preservation. The ancient Maya practiced complex mortuary rituals and detail provided by *anthropologie de terrain* allows for reconstruction of the ways in which the living continued to interact with the remains of the dead.

Residential history and kinship analyses provide data on individual life histories. They allow for further assessment of how one's actions during life may have contributed to their veneration as an ancestor after death. Residential continuity seems to be an important aspect of leadership for the contemporary Maya, while ancient Maya hieroglyphs and iconography depict royalty in association with material culture and locations far from the geographic Maya heartland. This research clarifies where mid-level leaders fell on this spectrum of mobility. Prior research showed that commoners were geographically mobile (Freiwald 2011; Wright 2012), but it is unclear if this was a factor that raised one to ancestral status.

Whether an individual traveled far or stayed in one location for most of their lives will affect relationship development, particularly with whom one reproduced. Kinship analyses have been used frequently in Mesoamerica to reconstruct population structure

and history. The present project will contribute new data from the Belize River Valley to assess whether biological relatedness was a factor that resulted in interment in eastern structures. Prior research suggests that people of diverse life histories were interred in eastern structures (Freiwald 2011), and therefore it is possible that those who were not lineage members were interred therein. As discussed in Chapter 4, scholars continue to debate the details of ancient Maya social organization, specifically the mechanisms by which kinship and common residence served to integrate ancient Maya society (Watanabe 2004; Miller 2014). The importance of lineage membership for inclusion in an ancient Maya social group remains unclear. It follows that it is similarly unclear whether lineage membership contributed to ones' selection as a venerated ancestor. The present research addresses this by comparing the dental metric and nonmetric traits of individuals interred in ancestral locations.

The complexity of the ancient Maya mortuary record and the intricacy of their social organization and cosmology necessitate the use of multiple lines of evidence (Watanabe 2004; Wiley 1989, 1992). Careful comparison of the results of these different datasets will provide a more nuanced, integrated perspective on ancient Maya mortuary behavior for a particular facet of society. The following chapter details the process of data collection and analysis for each dataset.

CHAPTER 8: MATERIALS AND METHODS

This chapter describes the sample selection and analytical methods used to address the four hypotheses set out in the research design. First, biogeochemistry data address expectation 1, that individuals who were born and raised locally are typically chosen for interment in eastern shrines and for veneration as ancestors. The present study contributes new $^{87}Sr/^{86}Sr$ data from the sites of Chan and Cahal Pech to the foundation established by Carolyn Freiwald (2011). Freiwald (2011) established a baseline of $^{87}Sr/^{86}Sr$ values using modern faunal, plant, and water samples and analyzed over 150 ancient human samples from the Belize Valley. The Chan and Cahal Pech data presented here are compared to her dataset.

Analysis of mortuary practices draw on archaeological context data and observations of skeletal articulation set out by the archaeothanatology method. These methods are used to address expectation 2, mid-level leaders in the Belize River Valley entered into relationships with their ancestors through interaction with ancestral skeletal remains. Data were collected from published archaeological reports and theses that span nearly 60 years. Demographic make up of the sample are also related here.

Biodistance analyses address expectation 3, that eastern shrines were the burial location of a biological lineage and that individuals interred there will be more closely related to each other than to individuals within other eastern shrines. Dental metric data were collected to address this expectation. The data are subject to pre-analysis data treatments, detailed here, before being analyzed using distance statistics.

A fourth expectation was also proposed, that these traits may fluctuate according to broader sociopolitical changes in the Belize River Valley and the Maya world.

Stratigraphic location and radiocarbon data were used to place all burials in a temporal frame. All data sets are analyzed for change over time and this will be referenced in the discussion.

Expectation 1: Biogeochemistry

Sampling strategy

The sampling strategy of human remains from Chan was designed to include individuals of both sexes and all ages as well as to reflect each period of occupation at the site (Table 1). To compare geographic origins to in the first and last years of life, enamel and a fragment of bone were sampled from each individual. The left first molars (maxillary or mandibular) were sampled preferentially as they begin to form approximately 10 weeks before birth (Hilson 1996). When a first molar was not available, a canine was sampled. Preservation of teeth and bone at the study sites was generally very poor; consequently in some cases any available tooth was sampled. In burials that contained multiple individuals, a tooth of the same class, arcade, and side was sampled to ensure that there was no sampling overlap. Robust fragments of cortical bone were sampled from each individual, preferably from the femur. For multiple individual burials femoral fragments from the same side were sampled to minimize the chances of sampling the same individual. The final dataset included 23 samples from Chan and six samples from Cahal Pech (Table 2)

Table 2. All biogeochemistry samples from Chan and Cahal Pech.

Laboratory number	Specimen number	Material	Time period	Context
ACL-4081	BRV CH2	femur	Terminal Preclassic	NE Str.
ACL-4083	BRV CH2	LRC	Terminal Preclassic	NE Str.
ACL-4084	BRV CH19	LRM2	Early Late Classic	W Plaza
ACL-4087	BRV CH19	femur	Early Late Classic	W Plaza
ACL-4091	BRV CH5.1	URM1	Early Late Classic	E Str.
ACL-4092	BRV CH5.1	femur	Early Late Classic	E Str.
ACL-4093	BRV CH12	URM1	Early Classic	W Str.
ACL-4095	BRV CH12	femur	Early Classic	W Str.
ACL-4105	BRV CH16-1	LRM1	Late Preclassic	W Str.
ACL-4107	BRV CH16-1	fibula	Late Preclassic	W Str.
ACL-4108	BRV CH1	femur	Middle Preclassic	Plaza
ACL-4109	BRV CH1	rib	Middle Preclassic	Plaza
ACL-4110	BRV CH10	URM1	Late Preclassic	E Str.
ACL-4111	BRV CH10	humerus	Late Preclassic	E Str.
ACL-4113	BRV-CH8	femur	Late Preclassic	E Str.
ACL-4114	BRV CH8	ULM1	Late Preclassic	E Str.
ACL-4116	BRV CH17	URM1	Late Preclassic	W Str.
ACL-4117	BRV-CH17	cranial	Late Preclassic	W Str.
ACL-4131	BRV CH3-2	LLM1	Late Late Classic	E Str.
ACL-4132	BRV CH3.2	mandible	Late Late Classic	E Str.
ACL-4133	BRV CH18	femur	Early/Late Late Classic	W Plaza
ACL-4137	BRV CH14	femur	Late Preclassic	W Str.
ACL-4139	BRV CH14	ULI2	Late Preclassic	W Str.
ACL-4061	BRV CP9	LRM1	Preclassic	E Str.
ACL-4062	BRV CP10	LRM1	Preclassic	E Str.
ACL-4065	BRV CP7-1	femur	Early Late Classic	E Str.
ACL-4071	BRV CP7-1	ULM1	Early Late Classic	E Str.
ACL-4069	BRV CP7-2	ULM1	Early Classic	E Str.
ACL-4073	BRV CP7-2	humerus	Early Classic	E Str.

Distinguishing "Local" and "Non-local"

Biogeochemical analyses rely on a baseline data from the study region to establish the variation of major, minor, and trace elements in flora, fauna, water, and soil. The geology and radiogenic strontium isotope values are well known throughout Mesoamerica (Hodell, et al. 2004; Price et al. 2008). Hodell and colleagues (2004) divide the Maya region into five geologic zones, the Northern Lowlands, made up of Paleocene and Eocene limestone, the Central and Southern Lowlands, also limestone but slightly older than the coast, the Motagua Valley, made up of metamorphic rock, the Southern highlands and Pacific coast, dominated by volcanic rock, and the Maya Mountains, made up of Carboniferous and Permian formations of shale, slate, schist, gneiss, and granite (Freiwald 2011:77-78; Hodell et al. 2004). The radiogenic strontium isotope values decrease from the northern, coastal lowlands inland towards the southern highlands. The oldest formations in the region are the Maya Mountains, which have some of the highest strontium values in the area, up to $^{87}Sr/^{86}Sr$=0.71120 (Freiwald 2011:74). The geology of Belize varies significantly within relatively short distances, thus providing an opportunity to track residential mobility in a fine-grained manner.

Freiwald (2011:81-83) analyzed samples of flora and fauna from the Belize River Valley and its tributaries for $^{87}Sr/^{86}Sr$ values. A pilot study showed that ancient human values corresponded with faunal values for the region (Yaeger and Freiwald 2009). Freiwald identified four "zones" in the Belize Valley region with distinct radiogenic strontium isotope values – the Vaca Plateau, the Belize River zone, the Macal River zone, and the Maya Mountains (Figure 3, Table 3). The radiogenic strontium isotope values along the Macal River and the Maya Mountains are previously unidentified in the Maya

region, while the values from the Belize River zone are similar to those found in the Yucatán Peninsula and the Central Lowlands (Freiwald 2011:77). The radiogenic strontium isotope values for the Maya Mountains are more variable than the values for the other zones. The Chan site is located very close to the convergence of the Vaca Plateau, Maya Mountain, and Belize River Valley zones (Ower 1927, 1928; Palmer and Elderfield 1985; Wright et al. 1959).

Table 3. Radiogenic strontium isotope faunal means and human means for sites in the Belize Valley. All data after Freiwald (2011:43) and Mitchell (2006) except the human values from Chan.

Site	Faunal mean	Human mean	No. baseline samples
Xunantunich	0.70861 ± .0001	0.70862 ±.0003	10
San Lorenzo	0.70861 ±.0001	n/a	n/a
Buenavista	0.70837 ± .0002	0.70847 ± .0001	6
Cahal Pech	0.70838 ± .0001	0.70865 ± .0002	19
Zubin	0.70838 ± .0001	0.70860 ± .0001	7
Esperanza	0.70841 ± .0001	n/a	n/a
Baking Pot	0.70841 ± .0001	0.70866 ± .0002	22
Floral Park	0.70844 ± .0001	0.70853 ± .00008	2
Barton Ramie	0.70844 ± .0001	0.70862 ± .0002	17
Blackman Eddy	0.70843 ± .0001	0.70856 ± .00007	3
Pook's Hill	0.70844 ± .0001	0.70845 ± .0002	8
Satruday Creek	0.70895 ± .0001	0.70869 ± .0002	7
Chaa Creek	0.70999 ± .0009	0.70950 ± .0003	8
Chan	0.70855 ± .0002	0.70856 ± .0001	4

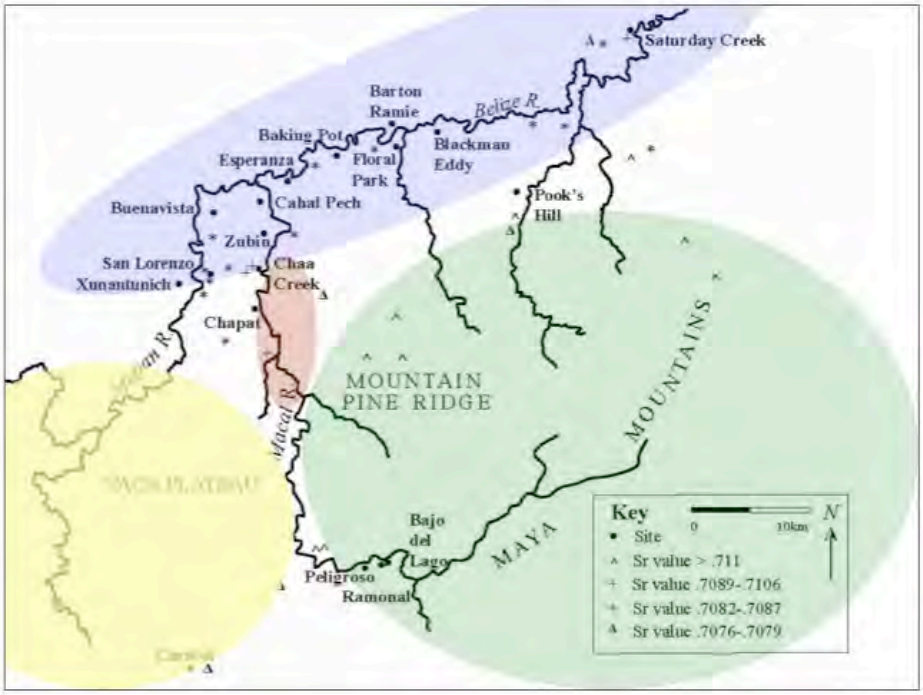

Figure 3. Radiogenic strontium isotope zones in the Belize River Valley and surrounding terrain (Freiwald 2011:84).

When inferring paleomobility from archaeological human $^{87}Sr/^{86}Sr$ values, food and water procurement strategies must be considered. Deer, for example, forage for several kilometers within their home range. Because $^{87}Sr/^{86}Sr$ values vary by as little as 20km in the Belize Valley region, it is likely that deer could be eating food from various geologic zones. Bone turnover would homogenize the $^{87}Sr/^{86}Sr$ values observed in bone. Another issue is that deer meat, as well as other food, can be traded between regions of different $^{87}Sr/^{86}Sr$ values. Thus, the deer could exhibit "non-local" $^{87}Sr/^{86}Sr$ values. This should also be kept in mind when interpreting human $^{87}Sr/^{86}Sr$ values, as the Maya may have been eating foods from other strontium zones or processed in a way that alters the strontium signature.

When distinguishing “locals” from “non-locals” there are two important factors to consider. Firstly, humans consume an omnivorous, varied diet that may have included foods from different geologic zones. If several different radiogenic strontium sources contribute to the diet then these will be averaged in teeth and bone, affecting the $^{87}Sr/^{86}Sr$ value. In addition, there is inherently variation in human $^{87}Sr/^{86}Sr$ values that is not currently explainable (Price et al. 2002:128). Radiogenic strontium isotope values can be altered through food preparation practices (e.g. grinding corn on a metate, adding imported sea salt to food) (Wright 2005; Fenner and Wright 2014; Pappa et al. 2010; Katz et al. 1974). Drinking water can differ in strontium content depending on if it has percolated through bedrock or if it was collected from rainfall (Bentley 2006).

Secondly, because bone remodels, radiogenic strontium values will vary by bone type and skeletal element. Depending on when human movement across the landscape occurred, and its duration, radiogenic strontium values could be affected. This concern is less pressing for teeth, as they do not remodel and, thus, capture the radiogenic strontium isotope value of the geologic zone of residence during the particular stage of enamel formation (Hillson 1996).

Finally, it must be considered that humans may have had several residences during their lifetime. Again, in bone, depending on the duration of residence, this will have an averaging effect on the radiogenic strontium values. The effect is a $^{87}Sr/^{86}Sr$ value with greater variation (Price et al. 2002:131).

Crucial to determining “local” from “non-local” individuals is a clear understanding of the amount of radiogenic strontium isotope variation in a region. There are several ways to approach this, including comparing human mean radiogenic strontium isotope values to faunal values, or using large gaps in the data set as cutoffs to define “local” and “non-local” (Tung and Knudson 2011). Studies have shown that collecting archaeological faunal $^{87}Sr/^{86}Sr$ values and comparing the human $^{87}Sr/^{86}Sr$ values to ± 2 s.d. of the faunal range is the best way to capture $^{87}Sr/^{86}Sr$ value differences between individuals that may indicate residence in different geologic zones (Price et al. 2002:131-132; Bentley et al. 2004:373). Archaeological samples are ideal, however modern samples can be used if not affected by pollution, agricultural fertilizers, or consumption of commercial pet or animal food as these factors will not reflect the local $^{87}Sr/^{86}Sr$ value (Price et al. 2002: 126). The type of fauna chosen for the baseline study is of crucial importance. Fauna should not range far from the geologic zone of the study area. Good candidates include small animals such as rodents, snails, mice, and guinea pigs (Price et al. 2000; Price et al. 2002:126). Also useful are pigs (Bentley et al. 2004) whom eat a similar diet to humans and do not range far.

Freiwald’s baseline study for the Belize River Valley contained eight radiogenic strontium values that define radiogenic strontium isotope variability at the sites of Chan and Cahal Pech (Figure 3). Three radiogenic strontium isotope values were collected from the wider Chan region. She collected iguana bone (*Iguanidae*) from the town of Succotz, located near the Chan site center, land snail shell (*Neocyclotus* sp.) from the site of San Lorenzo, located close to the Chan site center, and armadillo bone (*D. novemcinctus*), from the Trek Stop, a resort located near the town of Succotz (Freiwald

2011). I follow Freiwald's (2011:103) approach here, whereby all human values higher or lower than two standard deviations of the baseline faunal mean (Table 2) are considered to have resided within a geologic zone other than that of the Belize River Valley.

Elemental Conentration

Although major, minor, and trace element analysis are more regularly used to investigate diet in Mesoamerica (Schoeninger, 1979; Wright, 2006), recently they have been used as a way to estimate residential mobility. The minimal effects of changes to the plant/meat ratio of the diet and large geological variability in biologically available barium and strontium, in particular, suggest the potential utility of Ba/Sr ratios for addressing paleomobility (Burton et al., 2003). Further, as neither element is an essential nutrient the amount consumed in the diet will remain in the same abundance in the hydroxyapatite structure through the life of an organism (Ezzo, 1994:8; Burton and Price, 2000).

The elemental concentration data are useful for making tentative hypotheses concerning paleomobility at Chan and Cahal Pech to investigate further using radiogenic strontium isotope analysis. Interpretation of these data is hindered by a lack of trace element data in the published bone chemistry studies of the Belize River Valley region (Piehl, 2005; Freiwald, 2011). Thus, data presented here can address possible differences in residence during childhood and at death but cannot say whether that location of residence was in fact the Belize Valley. As discussed below, comparison to mean log(Ba/Ca) and log(Sr/Ca) values from other archaeologically recovered Maya remains provides one way to explore regional elemental differences.

Biogeochemistry Sample Preparation Procedures

All samples of bone and teeth were processed in the Archaeological Chemistry Laboratory (ACL) in the Center for Bioarchaeological Research at Arizona State University under the direction of Dr. Kelly J. Knudson. Prior to sample processing, all samples were given unique laboratory numbers and specimen numbers. The specimen numbers correspond to the site, burial, and individual from which the sample was taken and weighed.

Laboratory Procedures: Teeth.

Isotope analysis is destructive and teeth contain important genetic, dietary, and health information. To preserve as much information as possible, each tooth selected for analysis was photographed and cast in plaster. All teeth were analyzed for metric, non-metric, and pathological data by the author.

Samples of dental enamel were taken from each tooth using a Dremel MultiPro drill equipped with a carbide burr. The powdered tooth enamel was collected in a labeled, 1.5 mL centrifuge tube. The sample was then treated with 0.5 mL of twice distilled 5M nitric acid. The solution was left at room temperature until the enamel powder was completely dissolved. The solution was then taken to the ASU William M. Keck Foundation Laboratory for Environmental Biogeochemistry Metal-Free Clean Laboratory where the strontium isotopes were separated from the enamel matrix, as discussed below.

Laboratory Procedures: Bone

Because diagenesis is more of a concern for bone, each sample was mechanically and chemically cleaned prior to analysis. First, a 2.54 cm by 2.54 cm section of bone was mechanically cleaned with a Dremel MultiPro drill. Each section was cleaned until the color of the bone was uniform and all visible soil or rock was removed. The bone was then weighed and placed in a labeled, clean glass beaker for chemical cleaning.

Chemical cleaning began by pipetting 5.0 mL of distilled Millipore water into the glass beaker containing the bone sample. The beaker was then placed in an ultrasonic bath for 30 minutes. The bone samples were then treated with 5.0 mL of 0.8 M acetic acid and placed in the ultrasonic bath for 30 minutes more, after which they were rinsed with 5.0 mL of distilled Millipore water. The samples were then placed in the Thermo-Electron Corporation Thelco Laboratory oven at 122° F for three hours to dry. Dry bone samples were ashed in the Thermo/Electron Lindberg Blue furnace for 10 hours at 1472° F.

Two samples were taken from the ashed bone sample. A three milligram sample was taken and placed in a labeled, weighed, 15 mL centrifuge tube for trace elements analysis. The elemental concentrations of uranium, calcium, and phosphate in the sample can identify samples that may have been diagenetically contaminated. Four to six milligrams of bone powder was placed in 1.5 mL, chemically cleaned centrifuge tube for strontium isotope analysis. The remainder of the bone power was retained in an acid cleaned, 1.5 mL centrifuge tube. The samples were then transported to the ASU William M. Keck Foundation Laboratory for Environmental Biogeochemistry Metal-Free Clean for extraction of the strontium isotopes and analysis in the MC-ICP-MS.

Laboratory Procedures: Elemental concentration

Elemental concentration analysis sample preparation and analysis were performed under the direction of Drs. Kelly J. Knudson and Gwyneth Gordon. Ten milligrams of tooth enamel powder or chemically cleaned bone ash were then dissolved in 0.64 μL of 5 M HNO_3, and diluted with 9.36 μL of Millipore H_2O. Sample concentrations were analyzed by a Thermo Scientific iCAP Qc quadrupole inductively coupled plasma mass spectrometer (Q-ICP-MS) with a 100 microliter per minute nebulizer and a Peltier cooler in the W.M. Keck Foundation Laboratory for Environmental Biogeochemistry at Arizona State University. On April 10, 2013, internal standards CUE-0001 exhibited mean Ca/P=2.02±0.11 (1σ, n=7) and Ba/Sr=0.44±0.004 (1σ, n=7). Bone carbonate standard NIST-1400 exhibited mean Ca/P=2.00±0.01 (1σ, n=9) and Ba/Sr=0.94±0.01 (1σ, n=7) on April 10, 2013.

Laboratory Procedure: Strontium Collection

Radiogenic strontium isotope sample preparation and analysis were performed under the direction of Drs. Kelly J. Knudson and Gwyneth Gordon. Each sample of dissolved bone or enamel powder was placed in labeled 20 mL Teflon beakers and left to sit on a hot plate in the ASU William M. Keck Foundation Laboratory for Environmental Biogeochemistry Metal-Free Clean Laboratory at 50-60° C until the acid evaporated. The residue was re-diluted with 250 mL of 5 M nitric acid. The solution sat for several days to ensure that the sample dissolved in the nitric acid. Each sample was then run through glass columns fit with a foam tip. The columns are rinsed twice with 1000 mL of Millipore water and then 0.1 mL of Eichrom SrSpec resin was placed in the base of the

column. Total resin volume was approximately 50 μL. The columns are rinsed twice more with 1000 mL of Millipore water. This served as an additional filter for the sample. Each column was then rinsed once with 750 mL of 5M nitric acid and two subsequent times with 250 mL of 5 M nitric acid. Each column was allowed to run until nearly dry between cleaning cycles and the liquid is collected in an acid washed Teflon beaker. This liquid was then transferred to a 15 mL non-acid washed centrifuge tube and kept until the samples have been analyzed by the MC-ICP-MS. If an unexpected result is obtained, the liquid from the cleaning cycles can be analyzed for contaminants.

The sample is then loaded into the columns for strontium collection. Each column was flushed with 500 mL of Millipore water three times. This liquid contains the strontium sample and was retained in a Teflon beaker. These beakers were then placed on a hotplate at 50-60° C until the liquid evaporated. The dry sample was then re-hydrated with .64 mL of 5 M nitric acid. Finally, 9.36 mL of Milipore water was added to each sample.

The enamel samples were analyzed by Dr. Gwyneth Gordon using the Thermo-Finnigan Neptune multi-collector inductively coupled plasma mass spectrometer (MC-ICP-MS) in the W.M. Keck Foundation Laboratory for Environmental Biogeochemistry. Recent $^{87}Sr/^{86}Sr$ analyses of strontium carbonate standard SRM-987 yield a value of $^{87}Sr/^{86}Sr=0.710261\pm0.000020$ (2σ), which is in agreement with analyses of SRM-987 using a thermal ionization mass spectrometer (TIMS), where $^{87}Sr/^{86}Sr=0.710263\pm0.000016$ (2σ) (Stein, Starinsky et al. 1997), and analyses of SRM-987 using an identical MC-ICP-MS, where $^{87}Sr/^{86}Sr=0.710251\pm0.000006$ (2σ) (Balcaen,

Schrijver et al. 2005). On April 9-10, 2013, analyses of SRM-987 yielded a value of $^{87}Sr/^{86}Sr$=0.710241±0.000020 (2σ, n=58).

Expectation 2: Mortuary Ritual

Data were collected from reports and publications on the burials from the Belize River Valley. Variation in mortuary ritual is assessed using data from 28 sites and a total of 573 burials (Table 1, Appendix D). In the following I detail the structure of the study. Further details are available in Appendix D.

Burial Numbers

Synthesis and analysis of data collected by multiple researchers has inherent challenges. One challenge specific to burials is that nearly every project labels their burials a different way. In addition to different burial numbering, excavation recording also differs between projects. For instance, XAP excavations labeled their burials with a number specifying the operation and suboperation where the burial as found. The BVAR recording practices note from which mound or structure the burials were excavated. Older excavations, such as those of Ricketson at Baking Pot labeled burials according to which room or other architectural features they were found in. The degree of variation in burial numbers makes it difficult to build a database wherein individual burials can be compared.

The burials used in this dissertation were re-numbered in a consistent fashion to facilitate identification. The burial number as well as any contextual information was retained in the new number system as much as possible. The numbering system was

derived from one created by Sarah Clayton for her dissertation (Clayton 2009). The code provides information on the site, location, burial number, number of individuals, and, if there are multiple people, a letter indicating which individual within the grave. The result is a unique code for each burial that provides a lot of information in one glance.

Each individual burial was given a new number that begins with a unique two-letter code for the site from which the burial came. For example, burial numbers from Actuncan start with the letters AC, Baking Pot burials start with the letters BP, etc. Site codes are given in Table 5. Following the site code is a designation for the mound or architectural group from which the burial was excavated. Some projects included the excavation operation in the burial number. I have preserved this designation in my number system by adding OP and then the operation number in the context designation. The Actuncan project numbered burials this way, thus their numbers read AC.OP12.7.1.

The burial number assigned by excavators in the field follows the burial location code. Because there is a high incidence of multiple individual burials and other complex mortuary deposits in the Maya area, the burial numbering scheme must allow for this. This is another aspect of burial numbering that varies a lot between projects. I appended a capital letter to designate to which individual the record referred. Thus, Burial 2 containing multiple individuals from Baking Pot Mound 215 would be numbered: BP.215.2.A, BP.215.2.B, etc. For burials that hold the remains of only a single individual the number “1” was added to the burial number (i.e. BP.215.3.1).

In the case of the museum collections, there were skeletal remains that lacked a clear burial number or context designation, so I created a burial number based on the museum object number. It is critical that each burial had a unique identifying number.

While the lack of contextual information means that the remains are not useful in the mortuary portion of the dissertation, the dental data collected was still useful. There are burials from Barton Ramie that have a number that looks like “BR.N8857-69.?.?” to indicate the individual is from the site of Barton Ramie, but the burial and individual number is unknown. The “N” number is the accession number given to the burial by the Peabody curators. There are a few burials from Barton Ramie that had general excavation locus information but no structure or burial number and are titled “BR.L2015.?.?”.

The Barton Ramie burials seem to have had a letter added to an already existing burial number. These individuals also have different accession numbers. The Barton Ramie report does not record multiples in this way. They record them as different burial numbers. I assume that the appended letters mean that a second individual was found when the remains were analyzed in the museum. There is one case where the person labeling the individual was unsure of the burial number so the tag said “BR 123 14 (B?)”. I only found one burial 14 and only one is listed in the Barton Ramie report. I left the “B?” in the burial number for the dissertation.

Cahal Pech has hosted multiple projects working there and so burials were labeled according to the year the burial was excavated. This is true for most early burials. I incorporated that into the burial number space in the numbering system for the ones for which it was relevant with a dash after the year and then the burial number. For example, within Structure B1 in the site core burial 1 from 1989 is labeled “CP.B1.89-1.1”. This system was used for other sites excavated by BVAR in the early 1990’s as well, including Cas Pek, Figueroa, Tolok, Tzinic, Tzotz, and Zubin. I believe it was instituted by either Awe, for his dissertation, or by Rhan Ju Song when she was summarizing the burials

found to date for her 1995 report (Song 1995). I did not use the year numbers for sites that were only excavated in one field season, like Figueroa and Tzinic, or for sites that did not have overlapping burial numbers, like Tolok and Zubin.

Database and Variables

Appendix A gives a complete list of variables recorded for the mortuary analysis. Here, the basic types are defined. The type of data recorded for each mortuary variable varied by archaeological project. If a piece of information was not recorded for a burial it was entered as "Unknown", unless I could pull the data from a drawing or a photograph. Data were recorded for each variable in Microsoft Access and then exported in a Microsoft Excel file for analysis in Stata v.13 (StataCorp. 2013). Categories for mortuary data were recorded to those listed in Sprague (2005) and Duday (2011). They are defined as follows.

Form of Disposal

Form of Disposal, according to Sprague (2005), is the material into which the dead are placed as part of the disposal of the body (Sprague 2005). This category describes the space of decomposition, in the terminology of archaeothanatology (Duday 2011). A primary burial is defined as one for which decomposition of the body took place entirely in the location of burial. A secondary burial is defined as one that has occurred in at least two stages. The body is left to decompose in one location and then some or all of the skeletal remains are collected. The collected remains are deposited in a location other than the place of decomposition (Duday 2011:14). Secondary burials are difficult to

define because, according to Duday (2009, 2011) they require some inference of intentionality to distinguish a secondary burial from a secondary deposit (2011:92). He states that the criteria used to establish secondary burials are often explained by other circumstances, disorder of the bones, absence of small bones, and evidence for defleshing (2011:89-90).

Individuality

Individuality includes the number of individuals in a grave space. The variables single or multiple were recorded. In addition, the number of individuals was recorded.

Articulation

Articulation refers to the degree to which the skeleton elements are in correct anatomical position. The variables articulated, disarticulated, semi-articulated, and disturbed were recorded. Articulated means that the bones were all in their anatomical position and joints were in place. Disarticulated means that the individual is reasonably complete but some elements are not in the correct anatomical position. Disturbed means that the individual is incomplete and the bones are not in anatomical order (Sprague 2005:29, 79-83).

Position

Position of the body refers to the relationship of the body parts to each other. Sprague (2005:84) suggests that body position should be considered as if the body is floating in space and does not concern any other features of the grave or graves space.

The position is described with reference to the limbs and the head. Sprague (2005) follows Ubelaker (1999:15) in describing the angle of the limbs if the body is at 180°. Thus, an individual in an extended position has legs joining the torso at 180°. An individual with legs semiflexed has femora at an angle between 180° and 90° with respect to the torso. Flexed indicates the femora are between 90° and parallel with the torso (0°). Describing degree of flexure is typically described for the hip joint, as above, but Ubelaker (1999) also recommends describing the flexure of the knees independent from the hip. This is useful for the Belize Valley where individuals are sometimes found prone with knees flexed posteriorly at an angle between 90° and 180°. The position of the arms and legs were also recorded.

Deposition

Deposition includes the way in which the body is deposited in the grave, prone, supine, etc. Sprague (2005:31) cautions against using these terms to describe deposition as they can be confusing. They are commonly used, and used correctly, by researchers in the Belize River Valley and thus are used here.

Head and Face Orientation

Orientation refers to the cardinal direction of the head. Face orientation refers to the cardinal direction towards which the face was oriented upon excavation. Head orientation is an important element of Belize Valley mortuary patterning (Freiwald 2011).

Grave type.

Grave type details the construction of the grave, whether it was a simple bit or an elaborate stone-lined tomb. Appendix B provides definitions of grave types for the Maya area from Welsh (1988). These were modified slightly for the present study.

Intrusive

Intrusive refers to whether the graves were placed intrusively into existing architecture or whether they were constructed and then new architecture was built around them. In the literature, structure modification is said to accompany interment of ancestors as a dedication to their memory. This may vary according to context and social group.

Structure type

Structure type describes the structure in which the grave was found, including ritual, residential, etc. The different structure types used in the study are given in Appendix A. The eastern structures mentioned in the model, above, are noted as "Ritual East."

Site type

Site type refers to the type of site in which the grave was found. Sites were categorized based on architectural elaboration – lower-level, mid-level, and upper-level. (Table 4). More specific definitions of these site types are given in Chapter 4.

Table 4. Site types and sample sizes.

Site Type	Count (percent of total)
Lower-level	171 (27%)
Mid-level sites	164 (26%)
Unknown	3 (.004%)
Upper-level	275 (44%)
Total	613

Age and Sex

Sex may be estimated only for individuals whose skeletons are mature. Clinical studies have shown sexual dimorphism in pelvic shape to accommodate childbirth in females. For sex determination features of the pelvis were given precedence, particularly those of the pubic bone including the subpubic angle, the breadth of the medial aspect of the ischiopubic ramus, and the ventral arch, but the greater sciatic notch was also evaluated. Cranial morphology has also been shown to be sexually dimorphic, with male crania generally being more robust than female. Traits evaluated include the supraorbital ridge, glabella, nuchal lines, the mastoid process, as well as the mental eminence and gonial angle of the mandible. Trait descriptions for the cranium and the pelvis were consulted in Buikstra and Ubelaker (1994) and White and Folkens (2005). In addition to skull and pelvic morphology, the maximum diameter of the head of the femur was also consulted in the sex estimation, if possible (Bass 1995; Buikstra and Ubelaker 1994).

The sample size and distribution by site for sex is given in Table 5. Sex was estimated for 33% of the sample. Some remains were no longer accessible and so the designation given in the literature was used. Where possible, I estimated sex using the methods given above.

Table 5. Distribution of the sample by sex.

Site	Female	Male	Total
Baking Pot	15	12	27
Barton Ramie	13	13	26
Blackman Eddy	1	1	2
Buenavista	1	4	5
Cahal Pech	7	11	18
Cas Pek	1	3	4
Chaa Creek	3	8	11
Chan	4	9	13
Esperanza	0	2	2
Floral Park	3	0	3
Lower Dover	1	0	1
Ontario Village	0	1	1
Pacbitun	21	20	41
Pook's Hill	1	7	8
San José	8	12	20
San Lorenzo	1	0	1
Saturday Creek	3	1	4
Tolok	1	2	3
Tzotz	3	3	6
Xunantunich	3	7	10
Zopilote	0	2	2
Zubin	2	6	8
Total	92	124	216

The human skeleton undergoes changes over the life course. However, as an individual ages it becomes more difficult to estimate age at death accurately. Dental development in children, although sex and population specific to some degree (Hillson 1994), is an accurate way to estimate age until about age 20 years. Subsequent to that, we must rely on changes to the skeleton. In addition to the dentition, epiphyseal closure was also used to estimate age. The epiphyses of long bones gradually fuse to the diaphyses as maturation progresses providing a relatively good indication of age at death.

For adult remains, preservation permitting, changes to the pubic symphysis were privileged for determining age at death (Brooks and Suchey 1990; McKern and Stewart 1957; Gilbert and McKern 1973). The auricular surface of the ilium was also assessed for age changes (Lovejoy et al. 1985); the robusticity of this part of the pelvis gave better preservation. As teeth preserve well in the ancient Maya skeletal record dental wear was assessed, but only if no other indicators of age were available for observation. After adult teeth erupt, they begin to wear. The rate of wear will be specific to an individual's dietary habits, cultural food preparation techniques, as well as crown morphology, biomechanics of chewing, among other factors (White and Folkens 2005:365).

Assuming wear to be generally homogenous, dental wear related to age. Determining age at death based on dental wear is most accurate when the dentition of a large sample can be seriated (Lovejoy 1985). This has not been done for the ancient Maya, so dental wear was compared to charts provided in Buikstra and Ubelaker (1994), and White and Folkens (2005) to estimate a general age at death. Tables # and 1# in Appendix D give demographic information for the sample.

Archaeothanatology

To analyze the Belize Valley data according to the field anthropology method ("archaeothanatology"), I developed a model for disarticulation for how bodies disarticulated when placed in a prone, extended position. Most applications of field anthropology have dealt with interments that are supine, extended, or flexed. In many cultures the prone position is considered disgraceful (Weiss-Krejci 2003), and is therefore relatively uncommon. To date no researcher has published a general sequence of decomposition for a body in this position. The only referent is for more common positions like supine, extended, flexed, seated, etc.

All attempts were made to be as systematic in the analyses as possible. Archaeothanatology is meant to be applied to particular contexts, wherein a skeleton is analyzed only within its depositional context. All contexts vary in terms of depth from the surface, grave matrix fill, grave construction, as well as individual body characteristics (i.e. size and shape). It is not possible to apply a standard to all cases. It is expected that all cases will deviate slightly from the model norm, given the unique parameters of each grave.

One application of archaeothanatology is to assess whether the fleshed body was placed in the grave and subsequently covered with soil matrix or if the grave space was left unfilled. If the grave space was left unfilled, then the skeleton would disarticulation as the flesh gradually decomposed releasing the bones from their joints. If the grave space was filled with soil, the soil would gradually fill in the space around the bones left by the decomposing flesh and hold the joints in place.

The goal of the analysis was to assess whether burials within eastern structures are more likely to have been left open rather than filled with dirt. The reasoning is that if the living intended to communicate with the life-essences of the deceased, they may leave the body uncovered so as to maintain access to the bones. With this in mind I evaluated photos and drawings from the study sample to get a sense for the disarticulation patterns of bodies laid in this position. A total of 236 images were available for analysis. The total available images (photo or drawing) by site are given in Table 6 of Appendix D.

I followed the guidelines of Henri Duday (2009, 2011) who proposes that the joints that are first to decompose are those of small bones, like hand and foot phalanges, fragile joints, like the shoulder which is only held together by soft tissue, and the cervical vertebrae (Duday 2011). Some of the most persistent joints are the lumbosacral joint, the sacroiliac joint, the knee, and the ankle. Although the hip joints bear weight they break down quickly because they are well articulated osteologically. There is not much soft tissue holding the head of the femur in the acetabulum (Duday 2011). To prepare for analysis I reviewed images of the burials of the Belize Valley and carefully examined Duday's publications and those of his students and colleagues to find examples of individuals buried in a prone position. There were not many, but there were a few haphazard interments that were placed semi-flexed with torsos prone and the knees twisted to one side. These aided in developing hypotheses for the Belize Valley articulations. Some of the most obvious markers of a filled or open context are not observable for the prone burial, like the opening of the pubic symphysis and the flattening of the ilia and rib cage into space left open by decomposing viscera.

Degrees of articulation for specific joints aids in reconstructing sequences of deposition for multiple individuals in a single burial feature. Features containing multiple people must be analyzed with attention to the type of bones and how they are disarticulated. Thus, if two fleshed individuals were buried in the same tomb, and they have maintained their interphalangeal articulations, then they were likely deposited at the same time or within a very short period of time. The scheme I developed is one that will vary, depending on the depositional context and should be seen as a set of general guidelines. As with supine interments, assessing the placement of the skull is also important for those that are prone. If the space is open the skull will displace laterally if it is facedown, a very unstable position. Alternatively, a buried skull would be pushed forward by the weight of the mound. The mandible may or may not remain articulated at this time. The cervical vertebrae will remain important for estimating when in the decomposition process the head came to rest as it does. For instance, if the mourners placed the prone interment with its head turned to the side, then the head is likely stable, so long as the base of the grave is stable too, even if the body is decomposing in open space. In this case the cervical vertebrae will be twisted slightly but will likely remain articulated. If the mourners placed the head with the face pointing directly into the earth then the head will be in a very unstable position. If the body is surrounded by a soil matrix of firm consistency it will hold the head in place. The cervical vertebrae in this case are expected to be perfectly articulated and in a straight line. This is the case for many of the burials in the Belize Valley. I think that the position of the cervical vertebrae

and head are the best indicators of decomposition in open or closed space for this time and region.

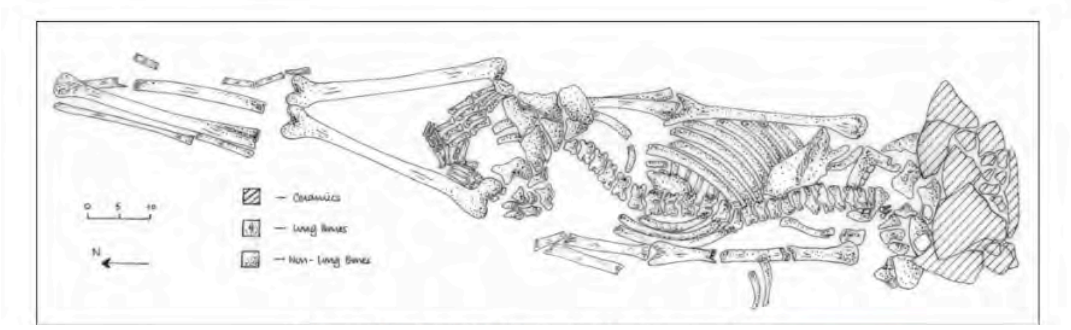

Figure 4. Chan Burial 9, an example of decomposition in filled space. Drawing courtesy of the Chan Project.

Figure 5. Barton Ramie Burial 10, an example of decomposition in filled space (Willey et al 1965; Figure 34).

In prone burials the spine appears to fall straight down into the chest and abdomen, sometimes pulling the sacrum with it. Otherwise, the sacrum tilts into the space left by the viscera. The ribs fall superiorly instead of inferiorly in the prone position. The ilia of the pelvis also fall superiorly into the space left by the viscera. The femora may fall slightly laterally and push the patella medially, or rest upon it. The scapulae will lie flat on the back in filled space, but in open space they are expected to slide forward and down towards the shoulder joint (see Figures 4 and 5 for examples).

The details relayed here are based on a very small number of burials, relative to the number of burials Duday and his colleagues excavated to compile the sequence of joint decomposition and disarticulation. My observations are preliminary and try to adhere not to a set standard but to joint sequence deterioration, as outlined by Duday. As was the case for all datasets, not all burials recovered from the Belize Valley have drawings or photographs associated with them.

Archaeothanatology and Mortuary Variability Data Analysis

Univariate statistical analyses are used to characterize and compare human mortuary taphonomy data within and between eastern structures, hypothesized to have been ancestral in nature, and between ancestral structures and other mortuary contexts (after Wright 2006:46-47; Braun 1979; O'Shea 1984). Mortuary variation was evaluated where appropriate using the chi-square statistic, with significant differences accepted at $p < 0.05$. All attributes in the mortuary dataset will also be evaluated for variability according to age and sex, with chronological age classes collapsed into subadult and adult to maximize sample size.

Correspondence analysis (CA) and multiple correspondence analysis (MCA) are data reduction techniques, similar to principal components analysis, but appropriate for categorical data. The procedure allows the rows and columns of data to be displayed as points on a scatter-plot. The points on the plot aid in identifying associations between variables (Baxter 1994:111-113). In some cases there were not enough data for an MCA so a simpler analysis using CA was used, for instance in comparisons of age and sex with the mortuary variables.

Expectation 3: Biodistance

For this thesis, the maximum buccolingual (BL) and mesiodistal (MD) cervical dental metric measurements were recorded with Hillson-Fitzgerald dental calipers (Hillson et al. 2005). Cervical measurements, defined below, are taken at the cement-enamel junction rather than at the maximum width and length of the crown (Figure 2). The cervical measurements are preferable for two reasons. First, the sample size is increased because teeth with interstitial wear facets and extensive occlusal wear can still be measured. Second, the MD measurement can be more easily obtained in teeth that are *in situ*. Stojanowski (2007) and Powell (1995) demonstrated that the cervical measurements were correlated with the mid-crown MD and BL dimensions. A table giving the mean, standard deviation, and sample size for each measurement by site is given in Appendix C.

The Hillson-Fitzgerald dental calipers, made by PaleoTech, are Mitituyo calipers fitted with fine points on the jaws designed for taking cervical measurements. The mesiodistal cervical diameter for anterior teeth, incisors and canines, is defined as the distance between the most occlusal points of the cement-enamel junction curve medially

and distally. For the posterior teeth, premolars and molars, the mesiodistal cervical diameter is defined as the midway point along the cement-enamel junction medially and distally. The buccolingual cervical diameter for anterior teeth, including the premolars, is the maximum distance between the lingual and buccal midway points on the cement-enamel junction. The buccolingual cervical diameter for molars is more complex. The cement-enamel junction does not have one point of outward maximum curvature, there are at least two. As a result, the measurement should be taken at the cement-enamel junction at the midway point along the buccal/lingual side (Figure 6; Hillson et al. 2005:418-419).

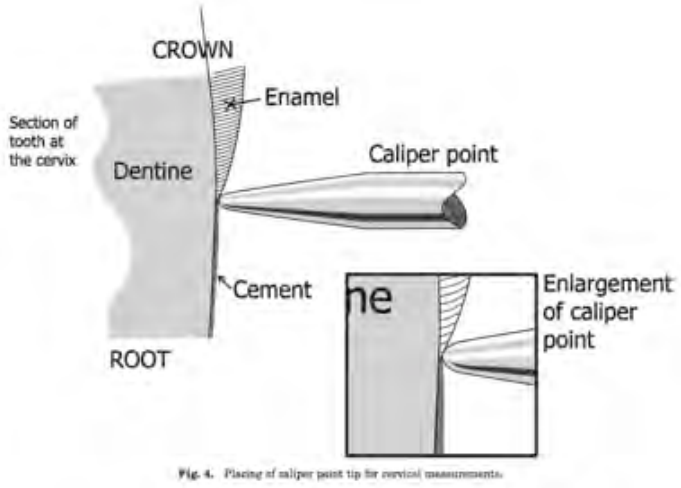

Figure 6. Location of CEJ measurements (Hillson et al. 2005:417).

Data were collected from only the polar, or key, teeth, the most mesial tooth in each tooth class (Dahlberg 1945, Stojanowski 2001, 2005:170). Polar teeth are considered to be more ontologically stable that the more distal teeth in the class (see Chapter 6). Measurements were taken from both the left and right sides. If teeth showed excessive attrition, calculus, or caries no data was collected.

Before each data collection trip I practiced with the Hillson -Fitzgerald calipers. I also did an intra and inter observer error study that is reported in the next section. During data collection I worked for 8-10 hours at time and took breaks every two hours. Dental metric traits were collected from 163 individuals from 14 sites in the Belize River Valley. The bulk of the sample dated to the Late Classic period and the analyses here will deal entirely with this subset of the data. The polar teeth from both sides were measured for a total of 32 measurements.

Inter and Intra Observer Error

To assess inter and intra observer error, the cervical dental metrics were taken from 25 individuals of the Semna South skeletal collection at Arizona State University. These individuals were remeasured before each data collection trip. The results were compared to those take by Mallorie Hatch, a graduate student in bioarchaeology at Arizona State University. Paired t-test statistics were used to estimate degree of error between our measurements. Values were assessed at the $p = 0.05$ level of significance. None of the p-values exceeded 0.05 indicating that we cannot reject the null hypothesis of no difference between the sample means (see Tables 7 and 8).

Table 6. Interobserver error assessment. All measurements are from the left side.

Tooth	n	*t* (*p* > 0.05 for all tests)	df	Mean difference	Mean absolute difference	Standard deviation of the difference
UI1MD	12	1.144	11	0.032	0.07	0.098
UCMD	14	-0.351	13	-0.005	0.04	0.053
UPM1MD	15	0	14	0	0.04	0.058
UM1MD	18	1.199	17	0.021	0.05	0.073
UI1BL	11	1.074	10	0.023	0.06	0.07
UCBL	12	1.016	11	0.01	0.02	0.034
UPM1BL	14	1.302	13	0.022	0.04	0.064
UM1BL	16	0.027	15	0.001	0.07	0.092
LI2MD	18	0.175	17	0.002	0.04	0.04
LCMD	19	-0.377	18	-0.005	0.04	0.055
LPM1MD	19	1.085	18	0.014	0.04	0.055
LM1MD	18	0.501	17	0.01	0.05	0.085
LI2BL	17	0.987	16	0.019	0.06	0.079
LCBL	19	0.54	18	0.005	0.03	0.042
LPM1BL	18	0.249	17	0.004	0.04	0.066
LM!BL	15	-1.102	14	-0.013	0.04	0.047

Table 7. Intraobserver error assessment. All measurements are from the left side.

Metric	n	*t* (*p* > 0.05 for all tests)	df	Mean difference	Mean absolute difference	Standard deviation of the difference
UI1MD	5	0.501	4	0.004	0.004	0.009
UCMD	6	0.442	5	0.020	0.020	0.100
UP1MD	5	0.080	4	-0.013	0.013	0.055
UM1MD	6	0.341	5	-0.033	0.033	0.314
UI1BL	6	0.484	5	0.013	0.013	0.090
UCBL	5	0.876	4	-0.013	0.013	0.072
UP1BL	5	0.393	4	-0.007	0.007	0.063
UM1BL	6	0.383	5	0.027	0.027	0.058
LI2MD	6	0.332	5	0.007	0.007	0.045
LCMD	6	0.329	5	-0.040	0.040	0.182
LP1MD	6	0.003	5	-0.020	0.020	0.064
LM1MD	6	0.133	5	-0.153	0.153	0.646
LI2BL	6	0.109	5	0.007	0.007	0.010
LCBL	6	0.158	5	0.007	0.007	0.027
LP1BL	6	0.174	5	-0.033	0.033	0.102
LM1BL	5	0.097	4	-0.022	0.022	0.022

Intraobserver error was assessed using materials from the sites of Chan and Zubin collected at an interval of one week. Measurements were assessed using a paired, two-tail t-test. The results are given in Table 7. All measurements are higher than the $p = 0.05$ level indicating that we cannot reject the null hypothesis of no difference between the sample means.

Missing data

Missing data are always a problem in archaeological samples. Both individuals and measurements were assessed for quantity of missing data. Individuals with six or fewer measurements (missing 80% of the data) were eliminated from the dataset. There were a number of individuals who still had a high percent of missing data. This was addressed by substituting the right side measurements when the left side was missing. After the antimere substitutions were made, individuals were eliminated who still had more than 50% missing data. This is not a conservative limit for eliminating variables. However, the anthropological questions addressed in this dissertation would not be answerable without conserving individuals and measurements that were missing more data than is optimal. A total of 101 individuals and one measurement were eliminated from the dataset.

A second reason to collapse sides is that left and right sides of the dental arcade represent redundant genetic information. To avoid introducing redundancy, as well as retaining as much data as possible, the right side antimere was substituted for the left side measurement (Scherer 2004; Powell 1995; Stojanowski 2005).

Multivariate statistical tests assume that the data are normally distributed. The

Lilliefors test, a normality test based on the Kolmogorov-Smirnoff test, was used to assess normality. It tests the null hypothesis that the data come from a normally distributed population. The test was done on the reduced dataset of 15 variables. Each measurement was also evaluated visually with a qqnorm plot. The D and p-values are given in Table 14. None of the measurements in the set of 15 departed significantly from the normal distribution at the 0.05 significance level so all were retained.

Table 8. Lilliefors Kolmogorov-Smirnoff test of normality

Metric	D	p-value
ULI1MD	0.1052	0.3994
ULCMD	0.0913	0.4558
ULP1MD	0.1351	0.09471
ULM1MD	0.0513	0.9969
ULI1BL	0.0964	0.7018
ULCBL	0.1075	0.1582
ULP1BL	0.1441	0.0894
ULM1BL	0.114	0.2966
LLI2MD	0.1316	0.4468
LLCMD	0.1406	0.1105
LLP1MD	0.0836	0.651
LLM1MD	0.0864	0.9827
LLI2BL	0.0876	0.9188
LLCBL	0.1114	0.8314
LLP1BL	0.1256	0.4221

Imputation

Skeletal data from the Maya region are notoriously poorly preserved, which leads to the issue of missing data, which can be address in various ways. The first is to delete incomplete individuals or variables, which would severely limit the sample sizes and effects variability. Another option is to substitute the measurement mean for each site for the missing values. This would decrease intra-group variation and increase divergence between groups. Hot deck imputation is a third option, wherein a random value is selected from within sample to substitute. A final option is to estimate the missing values using multiple imputation.

The best approach to imputation is to use the Expectation-Maximization (EM) algorithm. EM uses the known data to construct a correlation matrix and then using regression to estimate missing data. The correlation matrix is then re-estimated with new data. The algorithm is iterative so it is run until the new correlation matrix is as similar to the original dataset as possible. The data presented here were imputed using the EM algorithm in the statistical package STATA. However, there was so much missing data that this imputation failed to converge on the original dataset. The imputed data was therefore judged to be an unreliable estimate.

Recent work on data imputation methods for biodistance analyses assessed several imputation methods, Hot Deck, Iterative robust model (IRMI), K nearest-neighbor, and variable means (Kenyhercz and Passalacqua 2015). Values were deleted from a complete dataset of cranial metric traits and then imputed to assess the accuracy of each imputation method. Two datasets were assessed, one missing 25% of the data and one missing 50%. All analyses in R (R Core Team 2014) using the package VIMGUI

(Schopfhauser et al., 2011). The k nearest-neighbor imputation method produced an imputed dataset that had the highest total correct classification using the Mahalanobis D^2 distance statistic (Kenyhercz and Passalacqua 2015:15). The kNN algorithm takes the five most similar cases to the case with missing values used to generate a substitute value. I followed Kenyhercz and Pssalacqua (2015) method on the reduced dataset of 15 variables and 59 individuals. The extent of the missing data is visualized in Figure 5. The blue indicates present values and the red indicates the values that will be imputed. The bar graph on the left represents the percent of data missing for each variable.

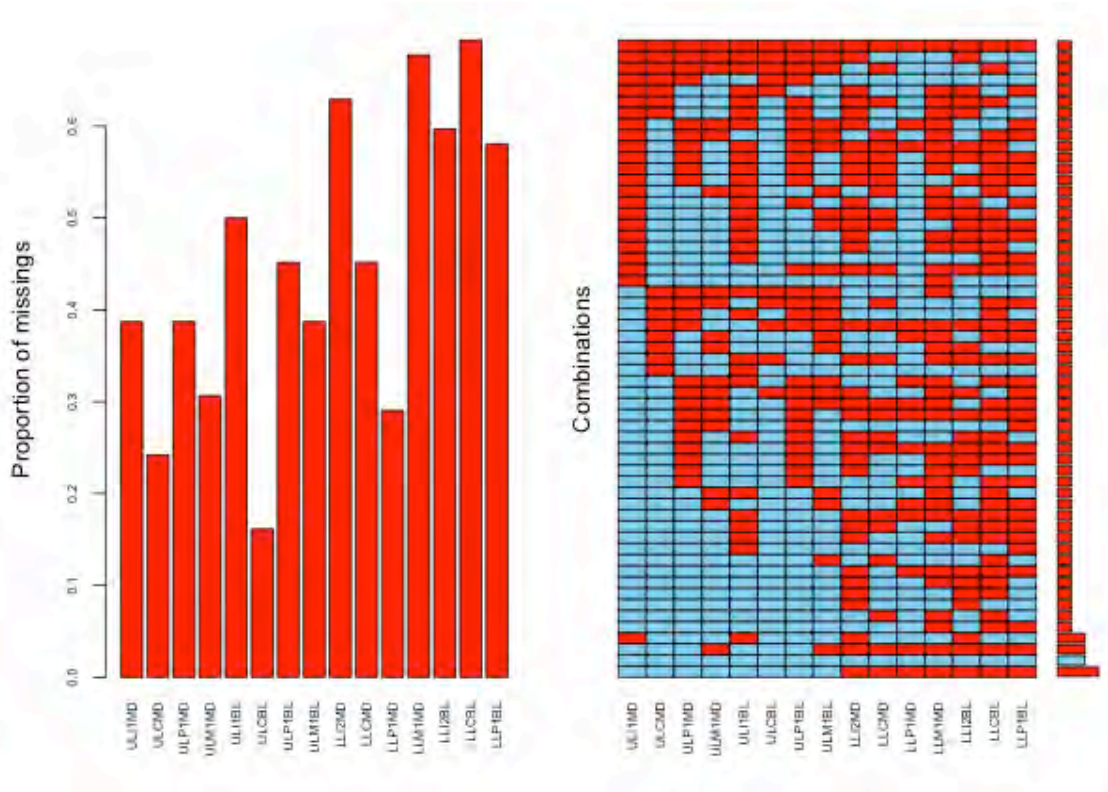

Figure 7. Visual representation of missing dental metric data by measurement. In the image on the right the missing data red.

After imputation, each value was re-assessed for normality using the Lilliefors

Kolmogorov-Smirnoff test of normality in R using the nortest package (Gross and Ligges 2015). Nine of the variables were not normally distributed. These variables were subsequently discarded (Table 15).

Table 9. Lilliefors Kolmogorov-Smirnoff test of normality. Measurements in bold were dropped from further analyses.

Metric	D	p value
ULI1MD	0.0939	0.2098
ULCMD	0.0862	0.3267
ULP1MD	**0.251**	**0.00003**
ULM1MD	0.0781	0.4836
ULI1BL	**0.1732**	**0.0001163**
ULCBL	0.0964	0.18
ULP1BL	**0.2042**	**0.00000014**
ULM1BL	**0.1373**	**0.00667**
LLI2MD	**0.1393**	**0.005495**
LLCMD	**0.305**	**2E-10**
LLP1MD	**0.1763**	**0.0000077**
LLM1MD	**0.194**	**0.000065**
LLI2BL	**0.1246**	**0.0212**
LLCBL	0.1114	0.8314
LLP1BL	0.1256	0.4221

Age and Sex Effects

Sexual dimorphism in dental metrics is well established (Garn et al. 1964; Potter 1972). Scherer (2004:184) found statistically significant differences between 75% of dental dimensions among the ancient Maya. Other factors contribute to possible sex biases in archaeological data samples, including that the sexes could be subject to differential burial treatment, and that accuracy of sex determination of archaeologically recovered remains can be inaccurate (Bello et al. 2006; Wright 1994:95). Sex was unknown for most of the present sample (Table 9). Researchers have combined sexes for analysis or used a discriminant function analysis to estimate sex based on data from

individuals for which sex was identifiable (see Stojanowski 2003). Discriminant function analyses require the majority of the sample to be of known sex and this sample does not meet those requirements. In line with other biodistance studies in the Maya region, the sexes were pooled for these analyses. To account for differences in tooth size according to sexual dimorphism the measurements were scaled for size using the Q-mode correction (Jungers et al. 1995; Paul et al. 2013; Scherer 2004; Corruccini 1973; Powell 1995). The Q-mode correction involves dividing each measurement by the geometric mean of measurements for that individual. The Q-mode correction must be done on a complete dataset so the imputed variables were used. In addition to neutralizing effects of sexual dimorphism, the Q-mode correction also eliminates allometric factors associated with tooth size and shape.

Mastication, aesthetic modification, and use of teeth as tools cause enamel attrition of the occlusal surface. Facets are also formed between teeth. All this results in loss of enamel and changes to size and shape. In order to account for wear on the occlusal and interstitial surfaces MD and BL measurements were taken at the cemento-enamel junction (CEJ). Affects of attrition due to advanced age are assumed to be minimal.

Analysis of Variance

Analysis of variance was used to test for differences between means and variances of measurements across sites (Sokal and Rohlf 2003:185, 218). A univariate analysis of variance (ANOVA) was performed to test for differences between measurements across sites. Only measurements that were normally distributed were used in this analysis. Levene’s test was used to assess the homogeneity of variances of the samples, an

assumption of the ANOVA test. Significance for the ANOVA is determined by comparison to the F statistic at the $p = 0.05$ level.

In addition, a multivariate analysis of variance (MANOVA) was used to compare inter-site differences between means using all measurements. MANOVA is useful because it can consider several dependent variables as well as multiple samples in the analysis (Sokal and Rohl 2003:860).

Principal Components Analysis

The effects of inter trait correlation are minimized because data form only the polar teeth were chosen for analysis. To further assess whether any traits were correlated, to ensure that genetic redundancy is minimized, Principal Components Analysis (PCA) was performed on the imputed, Q-mode corrected dataset. PCA reduces the original dataset to a set of new variables, the principal components that are ranked by the amount of total variance that they explain. The principal components are plotted to compare dental dimensions between sites. The sites that are closer together in the PCA have more similar dental dimensions implying some extent of shared genetic history.

Mahalanobis Distance

Mahalanbois D^2 is used to assess the distances between individuals at different burial locales (Mahalanobis 1936). The Mahalanobis distance is preferable because it accounts for variation between variables in the analysis, which is key for dental metric data as the dimensions have been shown to be correlated (Garn et al. 1965). The multivariate equation is:

$$D_{ij}^2 = (x_i - x_j)V^{-1}(x_i - x_j)$$

where x_i is a vector of k trait means for sample i, x_j is a vector of k trait means for sample j, and V^{-1} is the inverse of the pooled within-group covariance matrix for the k traits (Scherer 2004: 191).

Expectation 4: Social Transformation

Expectation 4 is addressed by assessing in what ways each variable changed over time. I used temporal designations given to each burial by the excavators. This was determined typically by artifacts within the grave, or within nearby contexts, stratigraphic position, or through radiocarbon dating of organic remains. In addition, human teeth from multiple individual burials were analyzed for radiocarbon dates to assess the span of time these grave spaces were being used, as well as to secure the temporal designation provided by associated artifacts.

The Belize Valley saw several periods of apogee and decline. The Late Preclassic period was a transformational time throughout the Maya lowlands, as it was in the Belize Valley. Population increase and the rise of larger centers like Cahal Pech, Buenavista, and Actuncan had an impact on the landscape. Some minor centers, like the Chan site, were already well established by the Late Preclassic and may have experienced these changes differently. The Early Classic is not well understood in the Maya region for several reasons. A distinct problem is that ceramic styles from the Terminal Preclassic continue to be used into the Early Classic, possibly obscuring local social change. Finally, the transition from the Terminal Classic to the Postclassic was a distinct sociopolitical shift in the Belize Valley.

It is during these eras that we may expect to see an increase in frequency in mortuary behavior focused on extracting skeletal remains. Not only were ancestral rituals possibly intensified, as a means to consolidate and display power in tenuous times, but if any group left the Belize Valley they may have decided to take ancestral remains with them, as Late Postclassic and Colonial era Quiche Maya recounted that they did when migrating to a new home (Carmack 1981). Finally, intergroup and intragroup conflict may have accelerated during this times; there is evidence that it certainly did in the Postclassic in the central Petén (Duncan 2005). If so, we may see an increase in trophy taking of body parts, such as crania or appendages like fingers. These body parts were typically cached as as sign of dominance (Houston et al. 2006).

To address whether mortuary practices were sensitive to social change, data were entered into the database with the most specific temporal assignment possible. However, due to small sample sizes they were later collapsed into the ranges specified here (Table 15). Sample sizes for each time span are also given.

Table 10. Chronology used in the analysis and associated sample sizes.

Chronology	Calendar years	N
Preclassic	1100 B.C. - A.D. 100/150	39
Terminal Preclassic	A.D. 100/150-250	24
Early Classic	A.D. 250-600	49
Late/Terminal Classic	A.D. 600-900	472
Postclassic	A.D.900-1200	9
Unknown	--	58
Total		651

Conclusion

A strength of this research is its integration of multiple bioarchaeological methods. The methods described here are applied to the data presented in Chapter 4. The following chapter will present the results of the biogeochemistry, mortuary, and biodistance analyses.

CHAPTER 9: RESULTS

Chapter 8 details the results of the bioarchaeological analyses. The hypotheses are addressed by each method. The chapter begins discussing expectation 1, whether individuals interred in eastern structures were most likely to have been locally born and raised. Data are given from two sites, Chan, a mid-level site, and Cahal Pech, an upper-level site. These data are contextualized with a larger biogeochemical study already done in the Belize Valley by Carolyn Freiwald (2011). Expectation 2, that individuals interred in eastern structures are more likely to show evidence for prolonged interaction of the living with skeletal remains of the deceased. Data are compared between Upper-, Mid-, and lower-level sites and across time. Expectation 3 is addressed in the third and final section. Expectation 3 proposes that eastern structures were maintained by lineages and that individuals interred therein were more likely to have been closely related to each other than to those interred in other locations. Expectation 4, that mortuary behaviors change over time in response to broader sociopolitical fluctuations, is address in more detail in Chapter 9 the discussion and conclusion.

Expectation 1: Commoner Mobility

Evaluating Diagenesis in Archaeological Human Samples

The ratio of calcium (Ca) to phosphorus (P) in archaeological bone should match the ratio in living bone if there has not been any diagenetic contamination. A value of 2.16 is accepted as the Ca/P ratio in living bone (Burton 2008:444; Mays 2003; Price et al. 1992; Sillen 1989; White and Schoeninger 1989). The mean Ca/P value for the

sampled remains = 2.24± 0.145 (1σ, n=14,) and the range is Ca/P=2.04 – 2.76. The sample with the value of Ca/P=2.76 was discarded as it was judged to have been contaminated. Several of the values are slightly high (~2.3). I elected to retain these values in the analysis as values this high have been retained in other studies (Wright 2006:121). Overall, teeth did not show less evidence of diagenesis or contamination than bone.

The ratio of U/Ca was also evaluated as a measure of sample quality (Hancock et al. 1993; Price et al. 2002). The mean U/Ca value for sampled remains is $9.13 \times 10^{-07} \pm 1.10 \times 10^{-06}$ (n=14, 1σ). This was judged sufficiently small that diagenetic contamination is unlikely. All elemental ratios are presented in log-transformed format as their distributions are often log-normal (Buikstra et al., 1989; Burton et al., 2003; Wright, 2006).

Elemental Concentration

Generally, log(Sr/Ca) elemental values for bone and teeth correspond closely in each individual, with the exception of Cahal Pech Burial 7.1 (Table 12; mean 1.20×10^{-04}, 1σ n=29). Individual 7.1 has values higher than all other values for teeth and a very low corresponding value for bone. This may indicate that she spent at least her early childhood in one location and the last 5-6 years of her life in another location. The Ca/P ratios of the bone and teeth from Burial 7.1 were 2.2 and 2.11, respectively, suggesting that this pattern is not due to diagenetic processes. No other patterns are discernible in the log(Sr/Ca) data. Similarly, very little patterning is discernible for the log(Ba/Ca) data (Table 12; mean 7.87×10^{-01}, 1σ n=29). For all individuals the values for teeth are consistently lower than for bone.

Burton and colleagues (2003) assessed the reliability of elemental concentration data for paleomobility studies that included Sr/Ca and Ba/Ca values from dental enamel in several locations, including the Maya region. They found statistically significant differences between the sites of Kaminaljuyu, located in the Southern Highlands, and Tikál, located in the Central Lowlands. The mean log(Sr/Ca) and log(Ba/Ca) from Chan was plotted with the values from Burton and colleagues (2003) (Figure 7). Additional elemental concentration data from Pusilhá (Somerville 2010), located in southern Belize, were added to further assess the differences in mean values by region. The Chan log(Ba/Sr) bone values are higher than enamel values for all individuals. Two individuals, BRVCH-19 and BRVCH-14 have noticeably lower enamel values than the others.

Chan site $^{87}Sr/^{86}Sr$ Results

The average value for human samples from the Chan site is $^{87}Sr/^{86}Sr=0.70856$. This is squarely in the range of values identified as local within Belize River Valley by Freiwald using the "local" range defined as the faunal mean ±2 standard deviations (0.70821 to 0.70908) (2011:124). There is more variation in the teeth values than in bone values (Figure 8; Table 12).

Table 11. Elemental concentration data from Chan and Cahal Pech.

Lab Number	Specimen Number	Material	Ca/P	Log(U/Ca)	Log(Sr/Ca)	Log(Ba/Ca)	Log(Ba/Sr)
ACL-4065	BRVCP-7.1	Femur	2.2	-6.87	-3.71	-3.36	0.76
ACL-4073	BRVCP-7.2	Tibia	2.13	-6.24	-4.22	-3.13	-0.11
ACL-4081	BRVCH-2	Femur	2.23	-5.45	-3.97	-3.96	-0.02
ACL-4087	BRVCH-19	Femur	2.19	-5.97	-3.99	-4.00	-0.09
ACL-4092	BRVCH-5.1	Femur	2.24	-5.63	-3.66	-3.80	0.05
ACL-4095	BRVCH-12	Femur	2.11	-5.65	-4.43	-3.72	-0.47
ACL-4107	BRVCH-16.1	Fibula	2.18	-5.69	-4.31	-4.45	-0.08
ACL-4108	BRVCH-1	Femur	2.37	-5.65	-4.05	-4.13	-0.31
ACL-4111	BRVCH-10	Humerus	2.11	-5.61	-4.47	-4.11	-0.05
ACL-4113	BRVCH-8	Femur	2.3	-6.03	-4.03	-3.99	-0.06
ACL-4117	BRVCH-17	Cranial	2.3	-5.54	-4.09	-4.05	-0.02
ACL-4132	BRVCH-3.2	Mandible	2.36	-5.71	-4.08	-3.97	0.00
ACL-4133	BRVCH-18	Femur	2.37	-5.82	-3.93	-3.90	-0.38
ACL-4137	BRVCH-14	Femur	2.34	-5.82	-4.05	-4.40	-1.68
ACL-4061	BRVCP-9	LRM1	2.04	-7.69	-2.46	-4.59	-0.60
ACL-4062	BRVCP-10	LRM1	2.16	-7.97	-4.02	-4.08	0.05
ACL-4069	BRVCP-7.2	ULM1	2.23	-7.91	-3.96	-4.73	-0.40
ACL-4071	BRVCP-7.1	ULM1	2.11	-7.54	-4.65	-4.57	-0.44
ACL-4083	BRVCH-2	LRC	2.36	-6.41	-3.88	-4.99	-0.76
ACL-4084	BRVCH-19	LRM2	2.14	-7.59	-4.34	-5.59	-1.67
ACL-4091	BRVCH-5.1	URM1	2.35	-7.41	-4.13	-5.04	-0.87
ACL-4105	BRVCH-16.1	LRM1	2.36	-7.67	-3.78	-5.38	-1.19
ACL-4110	BRVCH-10	URM1	2.32	-7.09	-4.13	-4.98	-0.65
ACL-4114	BRVCH-8	ULM1	2.14	-7.15	-4.39	-4.78	-0.60
ACL-4116	BRVCH-17	URM1	2.18	-7.47	-4.56	-5.23	-0.96
ACL-4131	BRVCH-3.2	LLM1	2.14	-7.35	-4.64	-5.47	-1.10
ACL-4139	BRVCH-14	ULI2	2.21	-7.24	-3.44	-5.32	-1.68

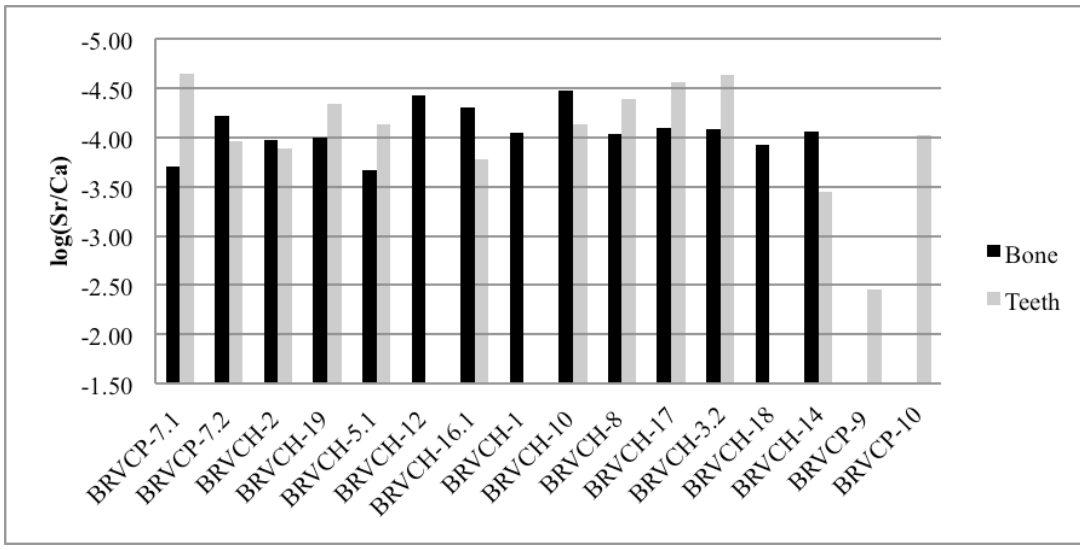

Figure 8. Log(Sr/Ca) values for bone and teeth from Chan and Cahal Pech.

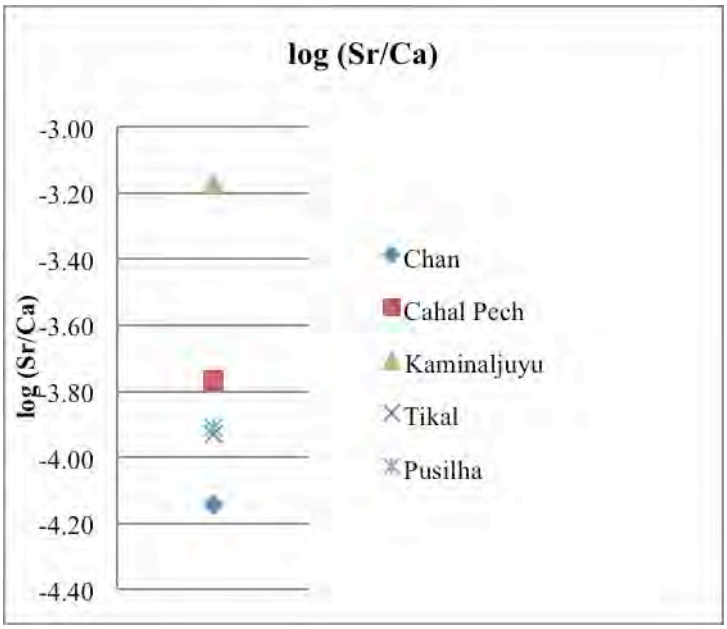

Figure 9. **Log(Sr/Ca) lowland Maya comparison**.

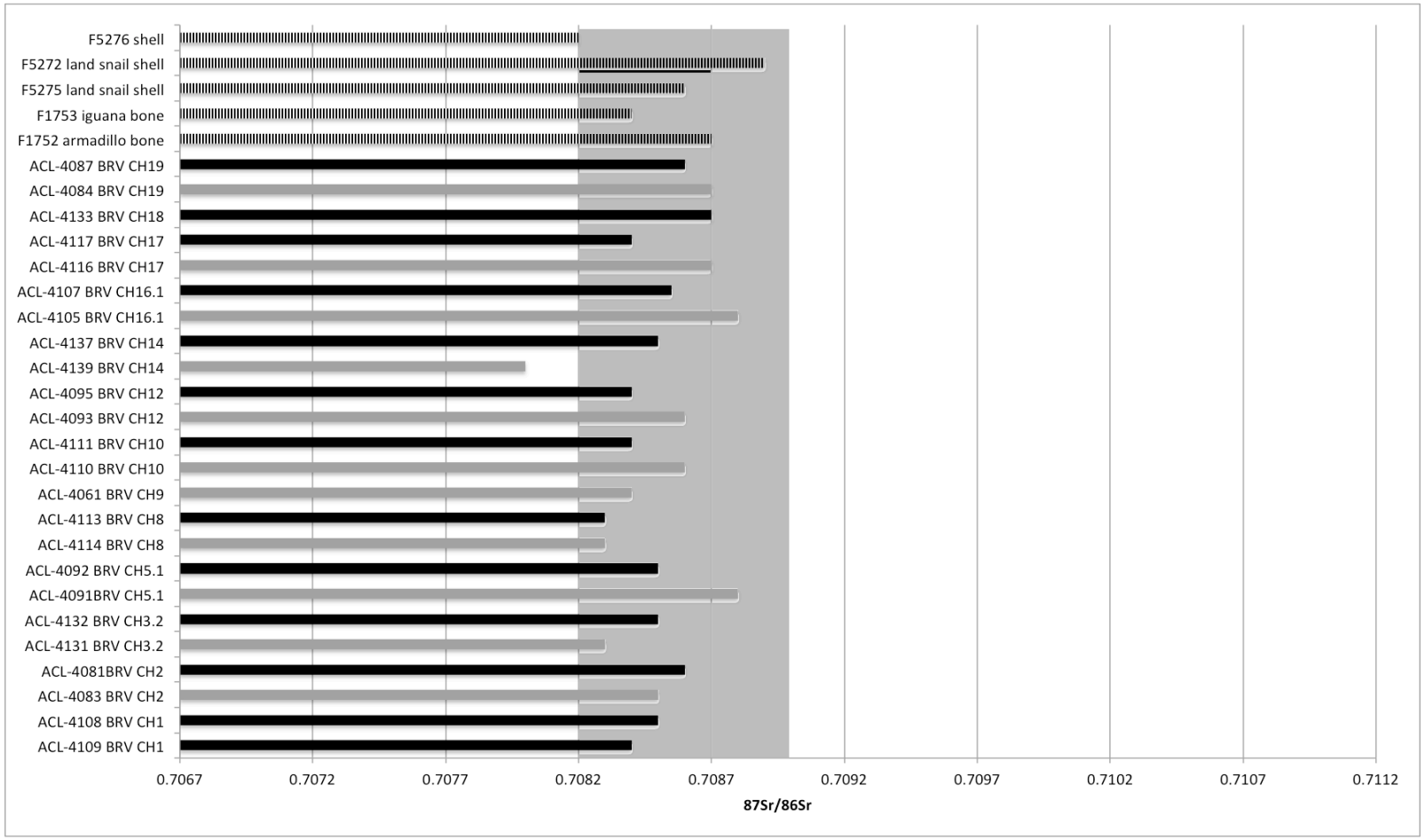

Figure 10. Radiogenic strontium isotope values for the Chan site. Baseline samples are marked with hashes, teeth are in grey, bone is black.

Table 12. Radiogenic strontium isotope values from Chan and Cahal Pech.

Laboratory number	Specimen number	Material	Time period	Context	$^{87}Sr/^{86}Sr$
ACL-4081	BRV CH2	femur	Terminal Preclassic	NE Str.	**0.70864**
ACL-4083	BRV CH2	LRC	Terminal Preclassic	NE Str.	**0.70859**
ACL-4084	BRV CH19	LRM2	Early Late Classic	W Plaza	**0.70877**
ACL-4087	BRV CH19	femur	Early Late Classic	W Plaza	**0.70867**
ACL-4091	BRV CH5.1	URM1	Early Late Classic	E Str.	**0.70889**
ACL-4092	BRV CH5.1	femur	Early Late Classic	E Str.	**0.70854**
ACL-4093	BRV CH12	URM1	Early Classic	W Str.	**0.70869**
ACL-4095	BRV CH12	femur	Early Classic	W Str.	**0.70841**
ACL-4105	BRV CH16-1	LRM1	Late Preclassic	W Str.	**0.70881**
ACL-4107	BRV CH16-1	fibula	Late Preclassic	W Str.	**0.70856**
ACL-4108	BRV CH1	femur	Middle Preclassic	Plaza	**0.70854**
ACL-4109	BRV CH1	rib	Middle Preclassic	Plaza	**0.70842**
ACL-4110	BRV CH10	URM1	Late Preclassic	E Str.	**0.70864**
ACL-4111	BRV CH10	humerus	Late Preclassic	E Str.	**0.70842**
ACL-4113	BRV-CH8	femur	Late Preclassic	E Str.	**0.70837**
ACL-4114	BRV CH8	ULM1	Late Preclassic	E Str.	**0.70839**
ACL-4116	BRV CH17	URM1	Late Preclassic	W Str.	**0.70872**
ACL-4117	BRV-CH17	cranial	Late Preclassic	W Str.	**0.70847**
ACL-4131	BRV CH3-2	LLM1	Late Late Classic	E Str.	**0.70834**
ACL-4132	BRV CH3.2	mandible	Late Late Classic	E Str.	**0.70858**
ACL-4133	BRV CH18	femur	Early/Late Late Classic	W Plaza	**0.70876**
ACL-4137	BRV CH14	femur	Late Preclassic	W Str.	**0.70855**
ACL-4139	BRV CH14	ULI2	Late Preclassic	W Str.	**0.70802**
ACL-4061	BRV CP9	LRM1	Preclassic	E Str.	**0.70843**
ACL-4062	BRV CP10	LRM1	Preclassic	E Str.	**0.70836**
ACL-4065	BRV CP7-1	femur	Early Late Classic	E Str.	**0.70895**
ACL-4069	BRV CP7-2	ULM1	Early Classic	E Str.	**0.70844**
ACL-4071	BRV CP7-1	ULM1	Early Late Classic	E Str.	**0.70872**
ACL-4073	BRV CP7-2	humerus	Early Classic	E Str.	**0.70858**

Cahal Pech $^{87}Sr/^{86}Sr$ Results

The individuals sampled from Cahal Pech, an upper-level site, were also interred in an eastern structure. The average strontium value the four people sampled is 0.70858,

which falls very near to the Belize Valley mean of 0.70861 (Figure 11). Comparison of teeth and bone samples indicates that the individuals for which there were these two types of data were present in the Belize Valley as juveniles and as adults (Table 12). The value for bone sample from individual 7.1 (CP.B1.7.A), an adult female, was slightly higher than the other values, although it was still within the local range of the Belize Valley. Mitchell (2006) sampled several other burials from structure B1 and these values are also all local values, consistent with the findings from Burial 7 (Figure 11).

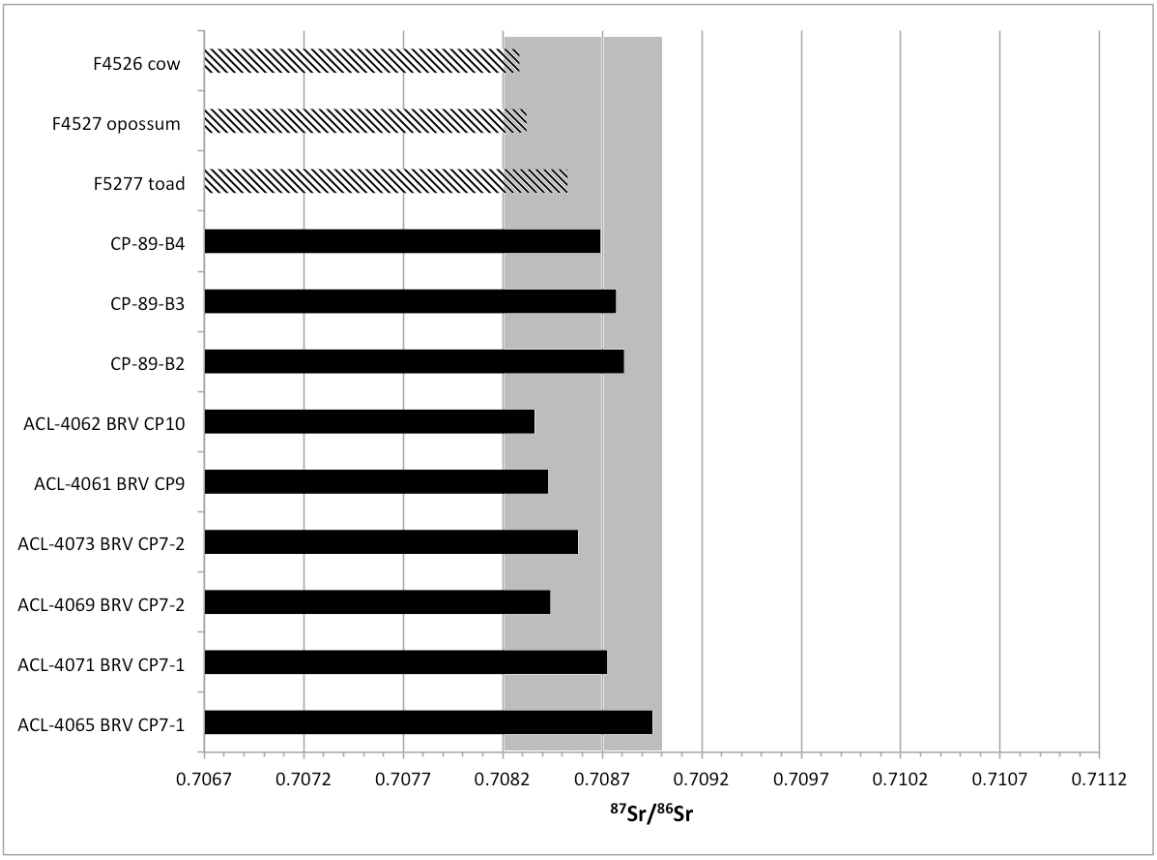

Figure 11. Strontium values from Cahal Pech, Structure B. Hashed bars are baseline faunal samples.

Conclusion

The data from Chan and Cahal Pech broaden our understanding of variation in residential history as it relates to burial location and ancestral contexts. There is variation between sites in the extent to which non-local individuals were interred in ancestral contexts. This variability will be discussed in full in the discussion. In the following section, the results of the mortuary analysis are presented.

Expectation 2: Mortuary Ritual

The results of analyses addressing expectation 2, whether ancient Maya mid-level leaders enter into relationships with deceased family members through manipulation of skeletal remains, are reported in this section. I begin by describing the most common elements of mortuary practices in the Belize Valley - body deposition, orientation, position, face orientation, form of disposal, and grave type - to illustrate the most typical body treatment. Multiple correspondence analysis (MCA) is conducted to reduce the data set and represent it visually to assess patterns not immediately obvious. MCA reveals the extent of the variability and suggests possible associations to investigate further. These potential patterns are pursued in the following section, wherein I relate mortuary practices specific to burials at mid-level sites, defined archaeologically as multi-component sites that with temples at least 5m high and several public plazas, and compare these data between eastern and non-eastern structures, as well as how they changed over time. I then compare these data to those from other site-types, Upper and lower-level sites. Upper-level sites are defined as sites that have monumental architecture (temple pyramids up to 60m high), carved stone monuments, multiple plaza

spaces, access to traded exotic items like jade, shell, and ceramics. Lower-level sites consist of residential groups of 3-5 structures surrounding a central plaza. A final section address variation according to age and sex. These results conclude with a summary highlighting the most significant findings of the mortuary analysis.

Mortuary practices in the Belize River Valley

When all time periods are taken into consideration, the typical burial treatment within the Belize Valley was comprised of interment in an extended, prone position with head to the south (Table 6 Appendix D). Data on orientation of the face were also collected, but this did not reveal any consistent patterning. Burials were typically primary, with fewer occurrences of secondary burials. Simple graves (pits dug into the earth without further elaboration) predominated in the Belize Valley. Graves were also typically intrusive into existing architecture. Skeletal remains, on the whole, were found articulated. Single individual burials were also the norm for the Belize Valley, and nearly all graves had been filled with soil after the body as deposited.

Although there is some regularity in to the Belize Valley burial patterning, there is clearly a lot of variability as well. Multiple correspondence analysis (MCA) was conducted to reduce this variability and reveal patterning in the data set. Figure 1 shows the MCA scatterplot for eleven mortuary variables – disposal, individuality, space, articulation, structure type, age, sex, grave type, intrusive, body position, deposition, and head orientation – for mid-level sites, Late Classic period burials. Thirteen variables were collected but several, including face orientation and arm and leg position, are not considered here because they varied too much to be meanginful. Individual sites were

also not included in this initial exploration of the data. An MCA including each site was conducted but it did not enhance understanding of the data set.

Figure 12 is a plot of the MCA. There is a dense cluster of variables just left of the origin, indicated by the circle, and this represents the most common mortuary attributes – primary, articulated, southerly head orientation, extended body position, filled grave space, and prone deposition. Structure types included in these dense, inner clusters are eastern structures and other ritual locations. Individuals of adolescent age are also part of this central cluster, as are interments in cist graves. There are a couple of interesting variables in the central cluster, including skeletal remains that were disturbed.

Points just peripheral to the central cluster, below the origin, include adults of all three age ranges (Young, Middle, and Old) and both sexes. Variable states further from the central cluster include ones that are less common, such as multiple individual burials, seated burials, skeletons in open grave space, and residential burials (see Table 1). There is clearly a lot of variation in Belize Valley mortuary data. The following analysis parses variables from this dataset according to the loose associations described above.

The following analysis addresses the central expectation that remains in eastern structures of mid-level sites will show a higher degree of interaction with skeletal remains by the living. It is organized into three parts. First, variables that relate to body treatment are assessed. These include body position, orientation, deposition, disposal, individuality, space, and articulation. The group of variables will be assessed initially using multiple correspondence analysis. Each variable will then be assessed for its frequency of occurrence 1) in all burial locations, 2) within eastern structures, 3) for temporal variability, 4) and their frequency will be compared with that of Upper and

lower-level sites. Where associations exist they will be tested using the Chi-square or Fisher's exact measure of association.

Second, burial facilities will be assessed. These variables include intrusiveness, grave type, and structure type. Burial facilities address the importance of maintaining access to a potentially ritually important material, human bone. If the ancient Maya were regularly re-entering burials for the purpose of extracting human bones then we might expect that graves that allowed easier access to bodies, for instance graves with capstones, may occur more frequently within ancestral structures and also have a higher incidence of disturbance and disarticulation. As with the analysis of body treatment, each variable will be assessed for frequency of occurrence 1) in all burial locations, 2) within eastern structures, 3) for temporal variability, 4) and their frequency will be compared that of upper and lower-level sites. Chi-square or Fischer's exact are used to measure association among variables depending apparent association in the MCA plots.

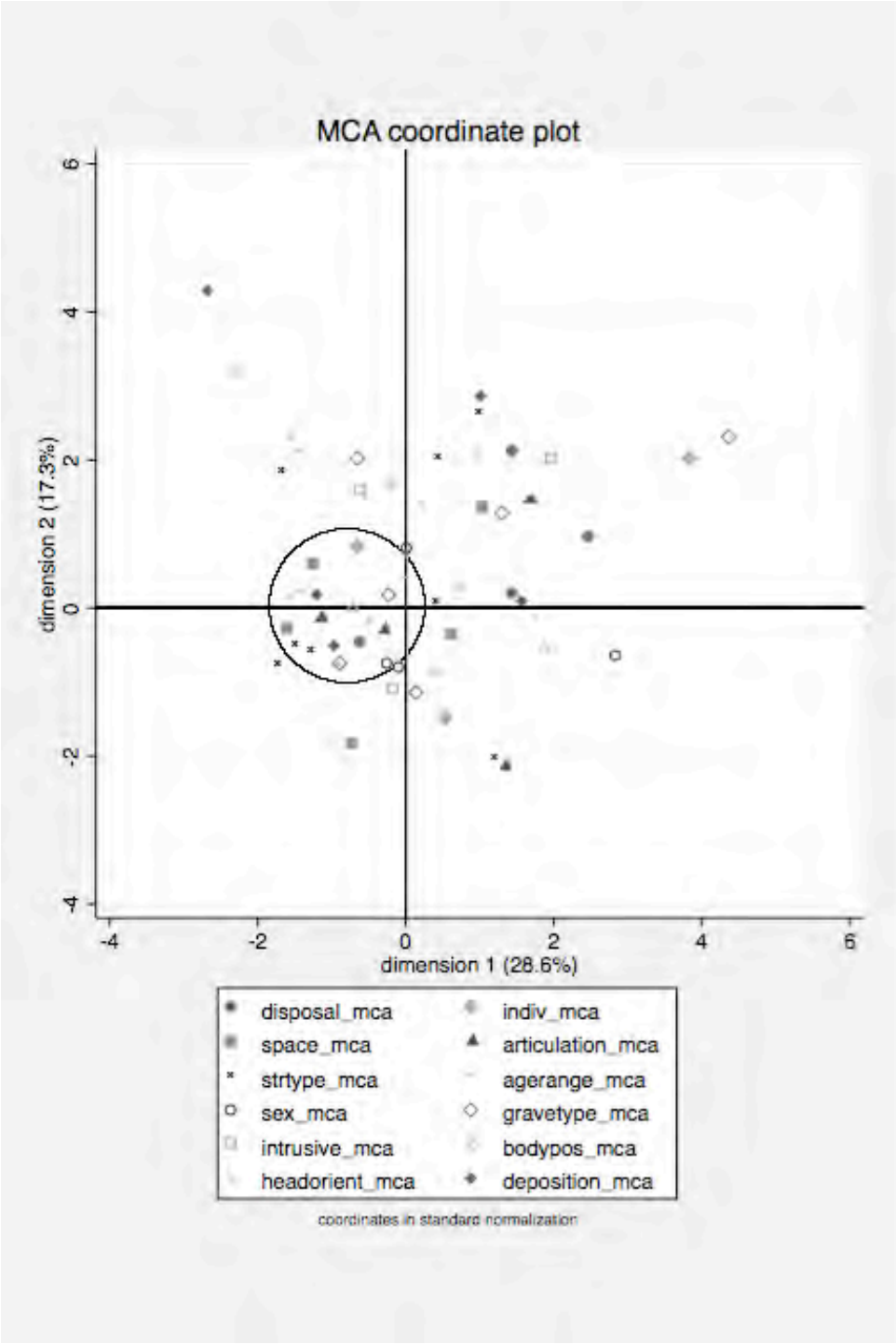

Figure 12. MCA scatterplot twelve mortuary variables, all mid-level sites, Late Classic period.

Third, differential burial treatment will be addressed with regards to age at death and sex. Expectation 2 suggests that older adult males, having served as leaders of mid-level sites during life, may have been preferentially interred in eastern structures. However, variability in age and sex has been observed at some sites. Multiple correspondence analysis will facilitate exploration of patterning in the data. Associations will be tests using chi-square or Fischer's exact, as appropriate.

Body Treatment

MCA was used to explore potential patterns in body treatment with respect to site type (Figure 12). Again, the cluster of points nearest the origin, enclosed by the black circle describes the most frequent variable states for body treatment – primary disposal, single individual, articulated, and prone body position. Eastern structures and other ritual locales are the closest structure types to the origin. The less frequent variable states, as well as the unknowns, are on the periphery of the plot. The three variables to the lower right are seated body position and orientation, and deposition. The following sections explore the mortuary data from the Belize River Valley.

Body deposition. It has long been acknowledged that the prone position was most common in the Belize River Valley (Willey et al. 1965). Almost 70% of the sample presented here was interred in a prone position. This is an interesting feature of the Belize Valley mortuary program because globally prone interments tend to be associated with deviance (Weiss-Krejci 2001; Arcini 2009; Murphy 2008).

At mid-level sites, the prone position was most commonly observed in all burial locations. Prone deposition is most consistent in eastern structures and both of these patterns are consistent over time (Figures 14 and 15). The prone and supine depositions occur in equal proportions during the Early Classic, although the sample size is very small. Seated burials were never found within eastern structures at mid-level sites, as was clearly represented in the MCA scatterplot (Figure 12).

At upper-level sites the prone position is the most common in the Preclassic and Terminal Preclassic when all burial locations are considered (Figure 16). Supine deposition became slightly more common during the Early Classic, although sample sizes from the Early Classic are generally small. The supine deposition remained common in the Late/Terminal Classic although the prone position was by far the most common. However, when burials from eastern structures are removed from the sample, the supine position was by far the most common burial position during the Late/Terminal Classic (Figure 15). Seated burials were found in eastern structures at upper-level sites, but only during the Early Classic (Figure 17). Isolated skulls were not recovered from eastern structures of upper-level sites. Prone deposition is common at lower-level sites in all time periods and in all burial locations (Figure 18).

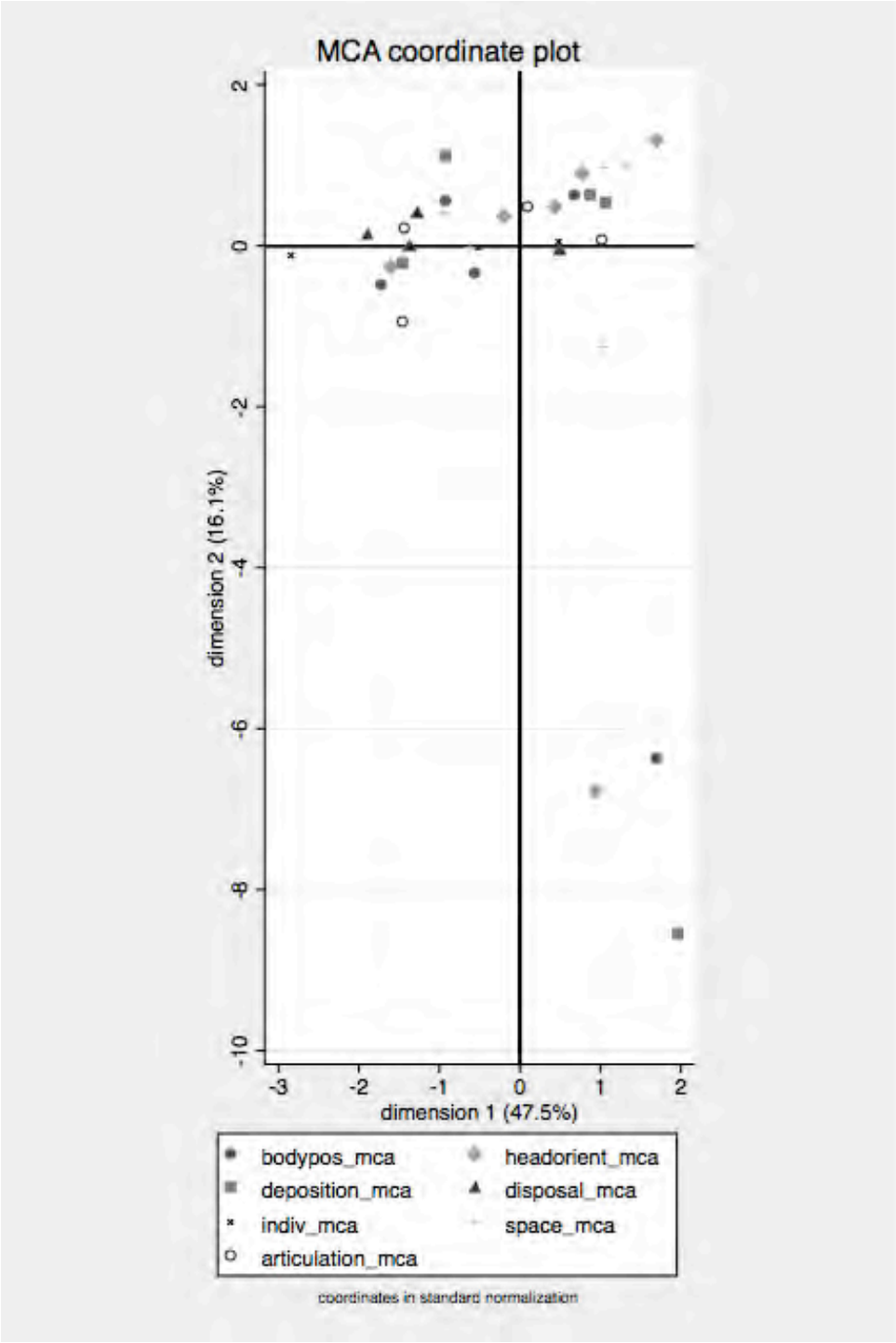

Figure 13. MCA scatterplot of body treatment variables at mid-level sites.

There were distinct differences between body deposition at mid-level sites and upper-level sites. The prone position was common in all structures at mid-level sites, and through time. At upper-level sites, when all structures are considered, the prone position is common only starting in the Late/Terminal Classic. The supine position is more common in the Early Classic, although samples sizes from this (n = 2) and earlier time periods (n = 4) are low. An interesting note is that the supine position is most common in the eastern structures of upper-level sites (supine n = 17, prone n = 6). While the prone position was most common at lower-level sites by far, there is variation in body deposition at these site types. There is less variation, generally, in eastern structures in terms of body deposition at mid-level sites and upper-level sites. Head orientation is considered next.

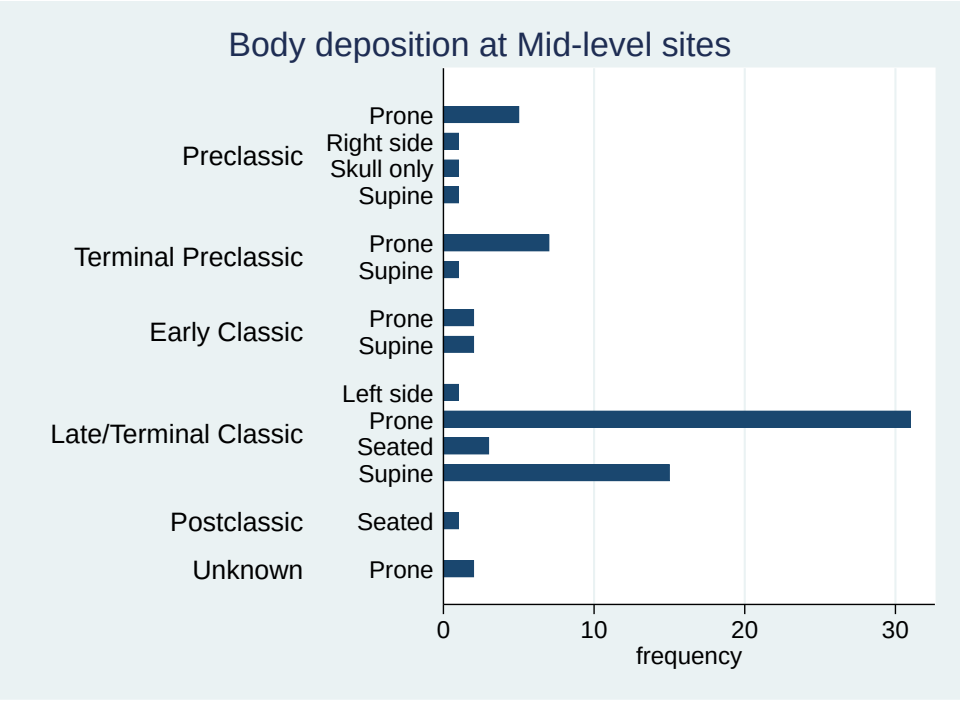

Figure 14. Body deposition over time at mid-level sites, all structures.

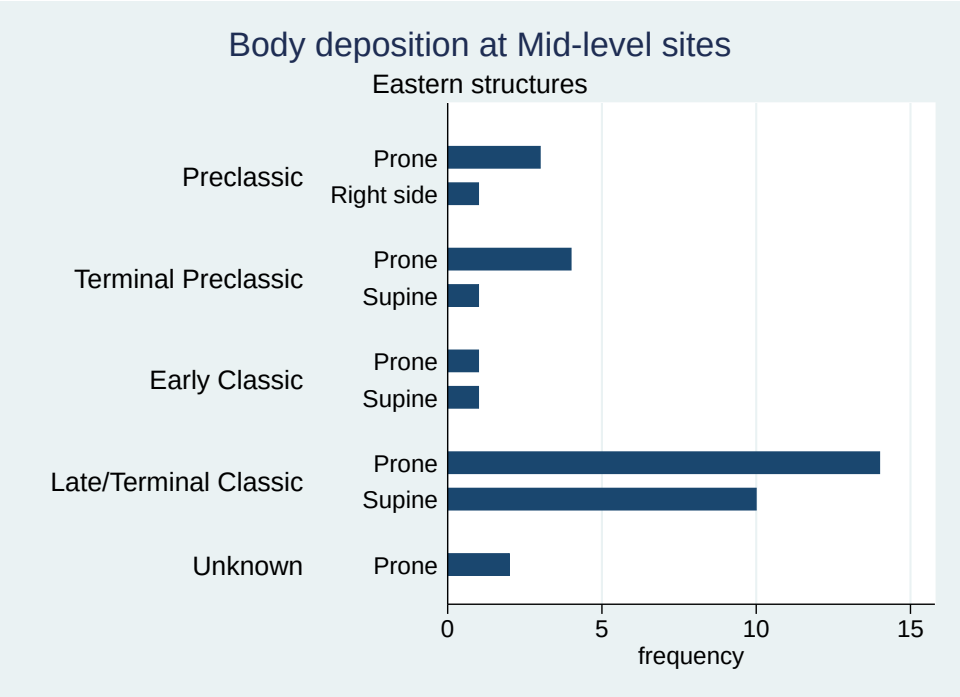

Figure 15. Body deposition over time at mid-level sites, eastern structures.

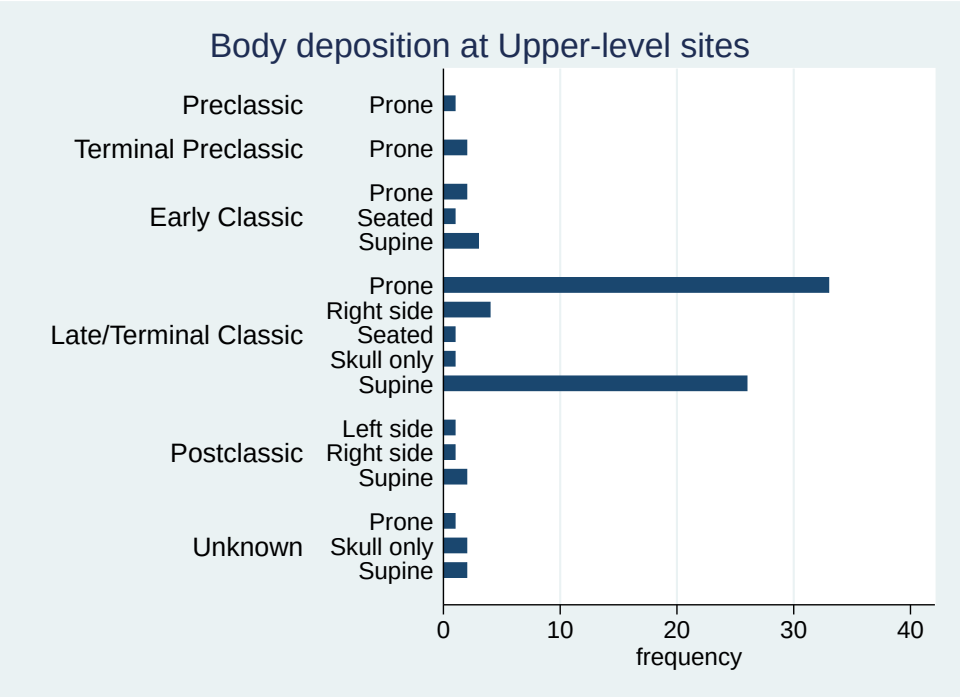

Figure 16. Body deposition over time at upper-level sites, all structures.

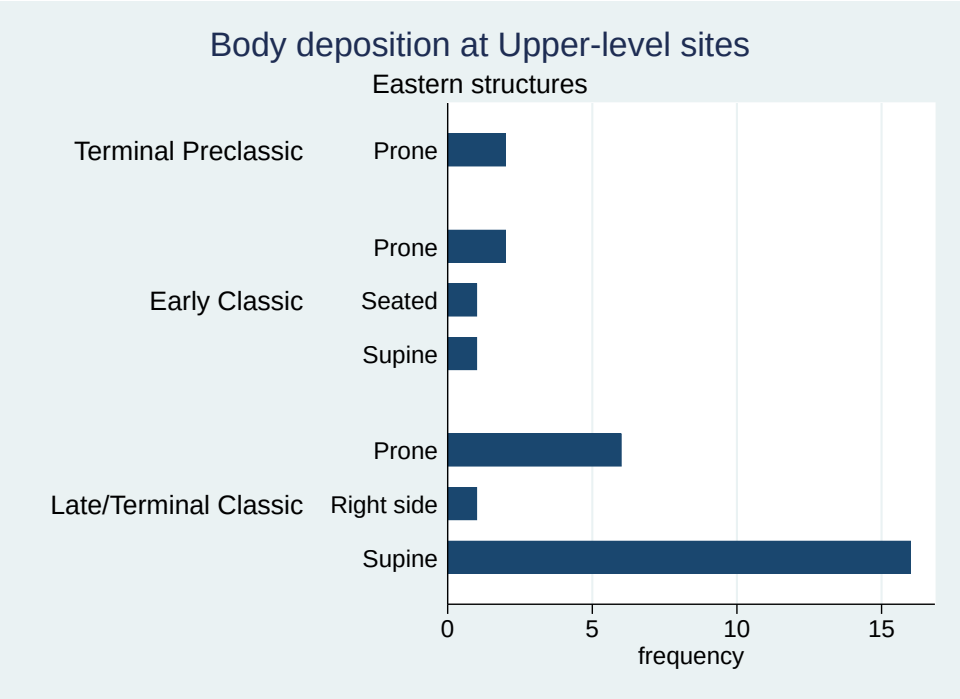

Figure 17. Body deposition over time at upper-level sites, eastern structures.

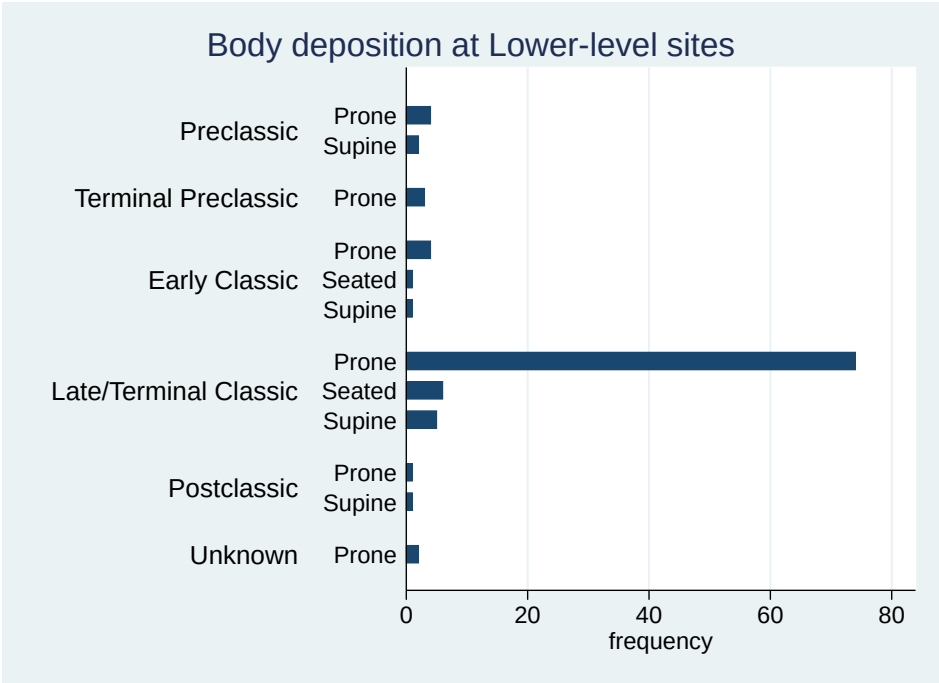

Figure 18. Body deposition over time at lower-level sites, all structures.

Head orientation. Head orientation refers to the cardinal direction to which the top of the skull is oriented. In the Belize River Valley the cardinal orientation of the head is very consistent. Heads are orientated predominantly to the south at all sites (Table 6, Appendix D). The pattern of heads to the south is most clear in the Late/Terminal Classic period (Figures 19-24).

At mid-level sites there is variability in head orientation when all burial structures are considered (Figure 19). Individuals interred in eastern structures were overwhelmingly interred with heads to the south, with the exception of several seated individuals (Figure 20). Head orientation of individuals within non-eastern structures clearly varies more than those in other burial locations (Figure 21). The head to the south pattern is consistent through time.

Head orientation at upper-level sites was predominantly head to the south (Figure 22), particularly in eastern structures (Figure 23). Similar patterns are observed in lower-level sites (Figure 24). In sum, the Belize Valley burials are distinct in their consistency in head orientation. There is more consistency generally within eastern structures than within non-eastern structures with respect to head orientation. The head-to-the-south trend is most evident in the Late/Terminal Classic era, although this is the era to which most of the sample dates. Body position is discussed next.

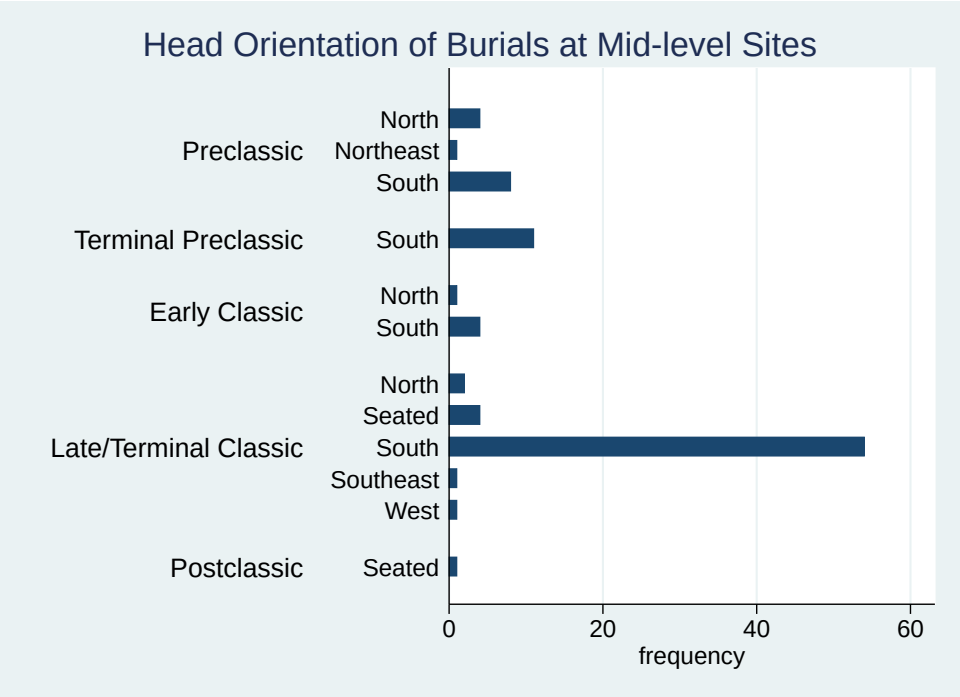

Figure 19. Head orientation over time at mid-level sites, all structures.

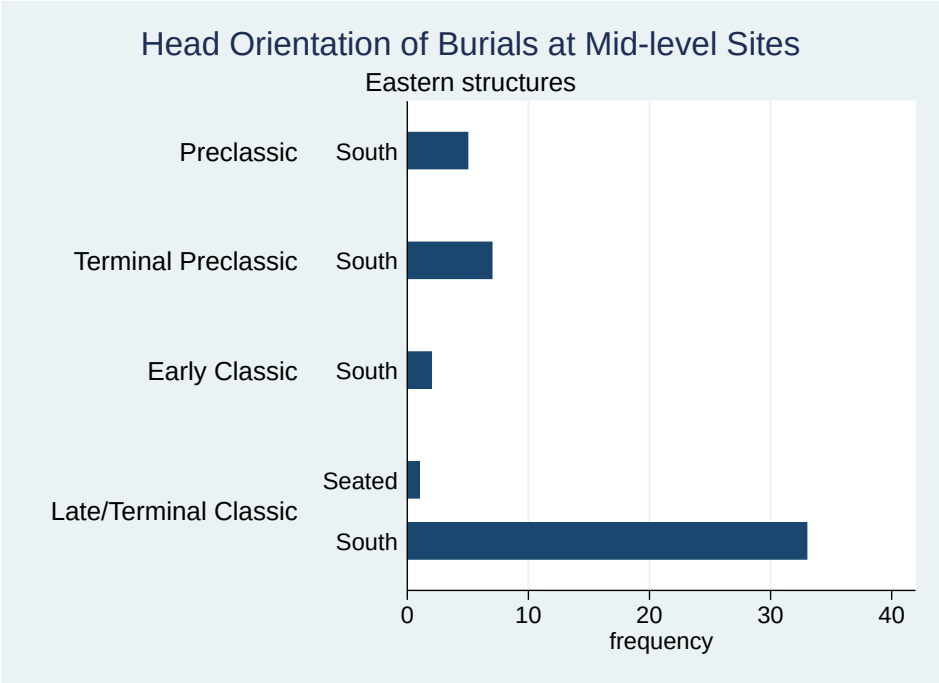

Figure 20. Head orientation over time of burials at mid-level sites, eastern structures.

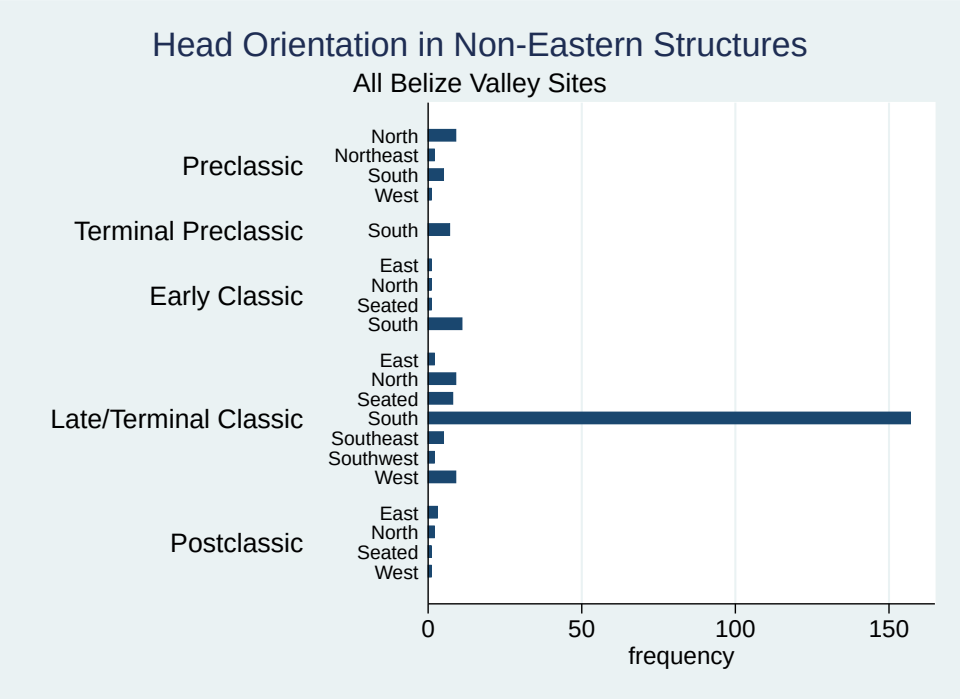

Figure 21. Head Orientation over time in non-eastern structures.

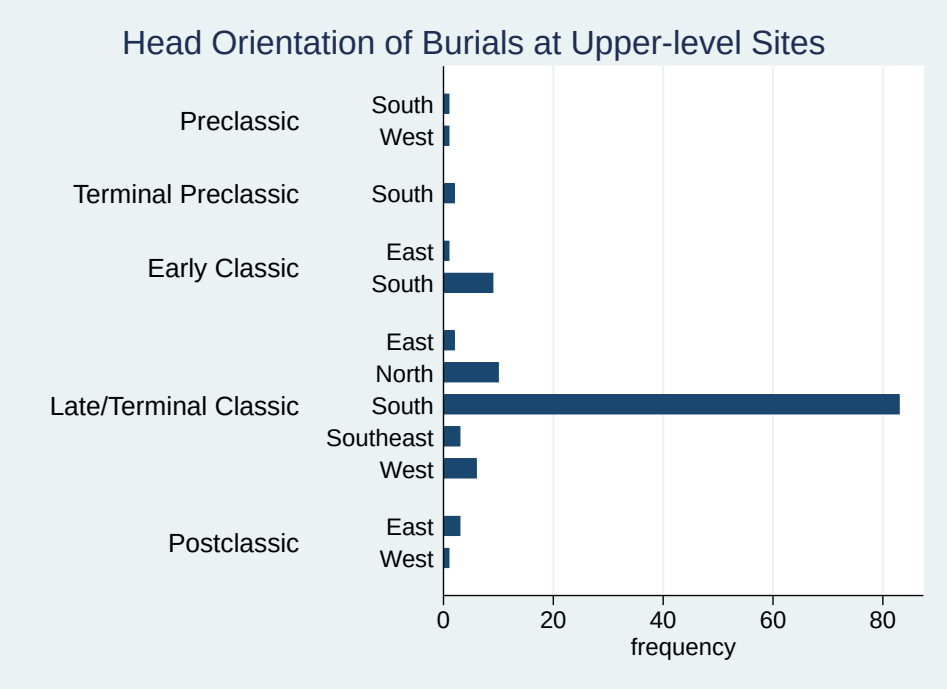

Figure 22. Head orientation over time at upper-level sites, all structures.

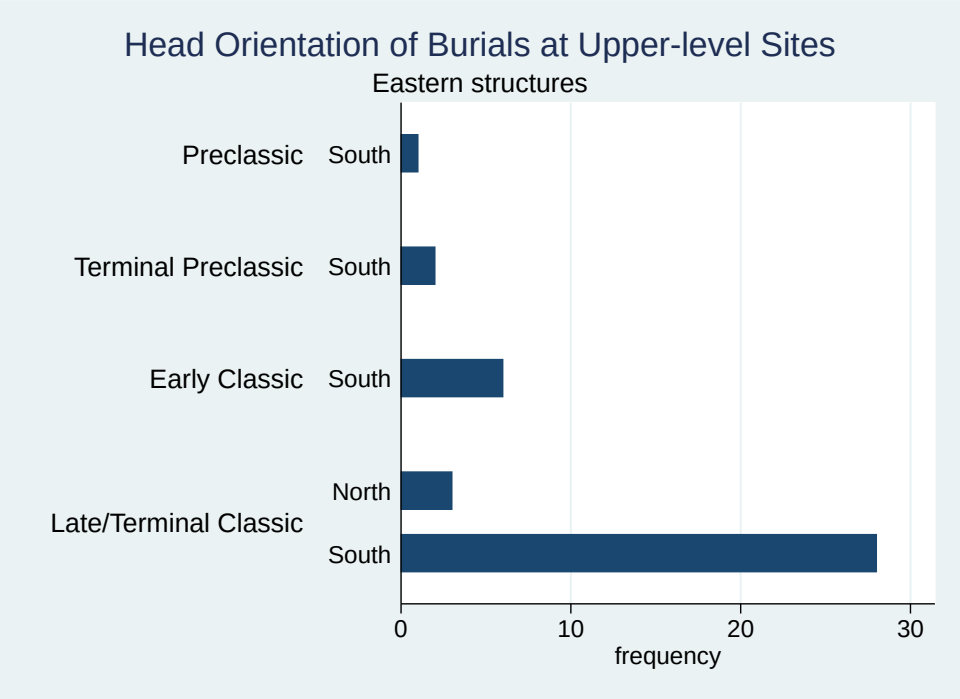

Figure 23. Head orientation over time at upper-level sites, eastern structures.

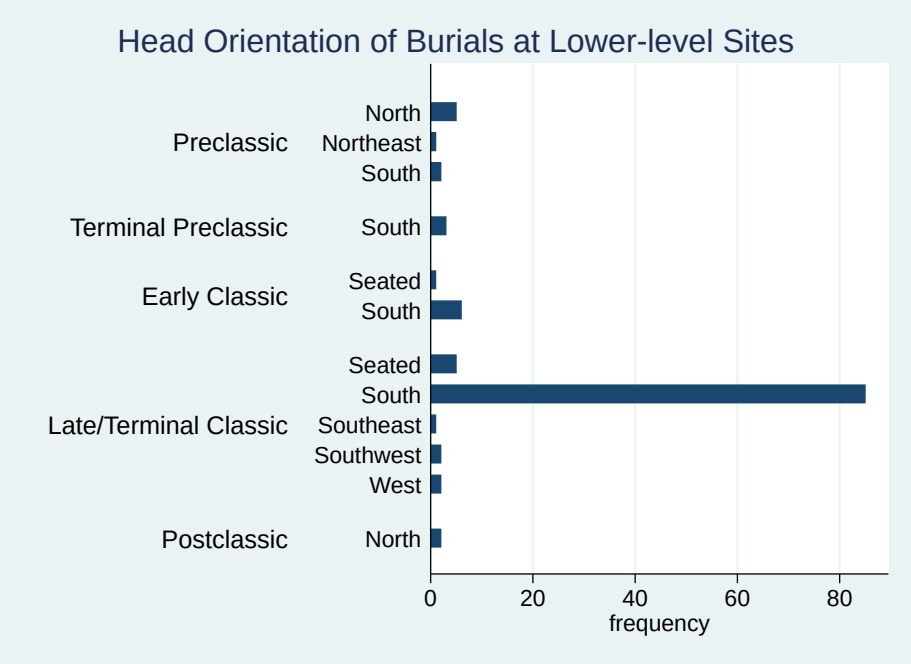

Figure 24. Head orientation over time at lower-level sites, all structures.

Body position. Body position refers to the relation of the segments of the body relative to each other (Sprague 2005:83). Burials in the Belize River Valley were predominantly in an extended position when taken together as a whole (Table 6, Appendix D). At mid-level sites this was consistent through time (Figure 25). However, at mid-level sites there was more diversity in body position in the Late Classic than in previous time periods (Figure 25). When all time periods are taken into account, individuals interred in eastern structures at mid-level sites are predominantly extended (n = 40) (Figure 26). There is only one flexed burial in earlier time periods.

At upper-level sites there was more diversity in body position in the Late Classic than in previous time periods, although there are far more burials with data on body position from the Late Classic (n = 215; Figure 27, 28). Burials in eastern structures were predominantly extended and this was more consistent over time than in other site types (Figure 28). At lower-level sites there was diversity through time, although the sample sizes are small (Figure 29). There were flexed burials in all time periods.

In sum, there is a lot of diversity in body position at all site types, although the extended position predominates. As for other mortuary variables, there was less variety and more consistency in eastern structures at all site types. Form of disposal is considered next.

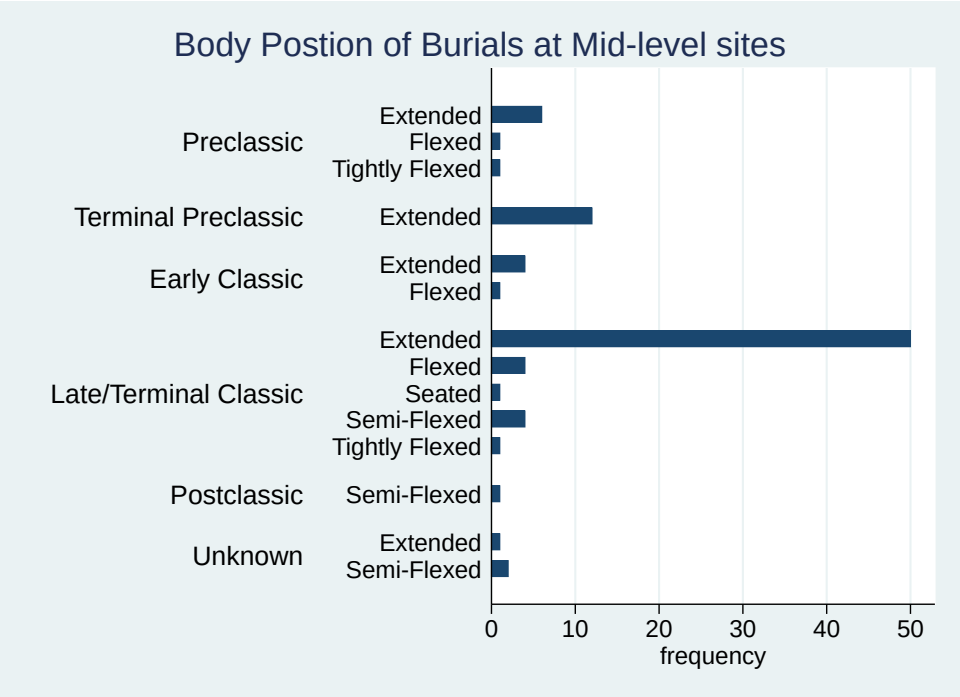

Figure 25. Body position over time at mid-level sites.

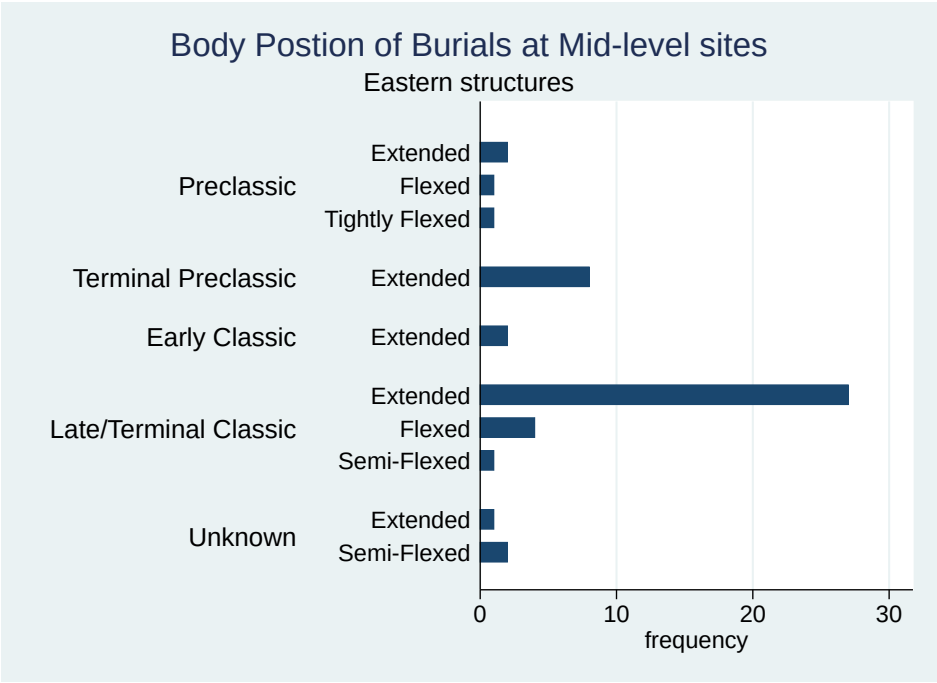

Figure 26. Body position over time at mid-level sites, eastern structures.

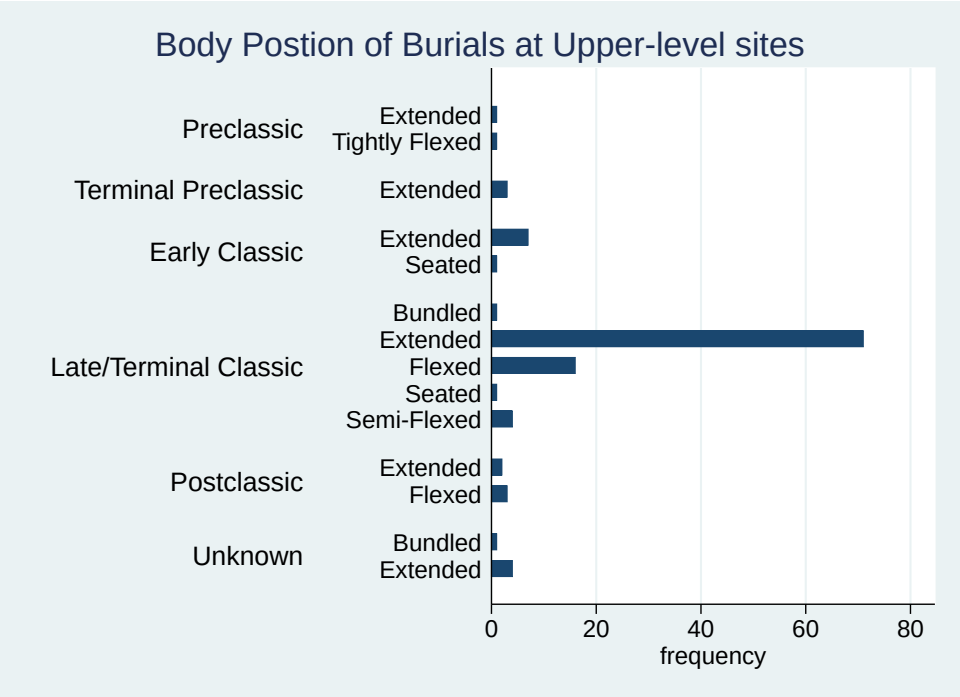

Figure 27. Body position over time at upper-level sites, all structures.

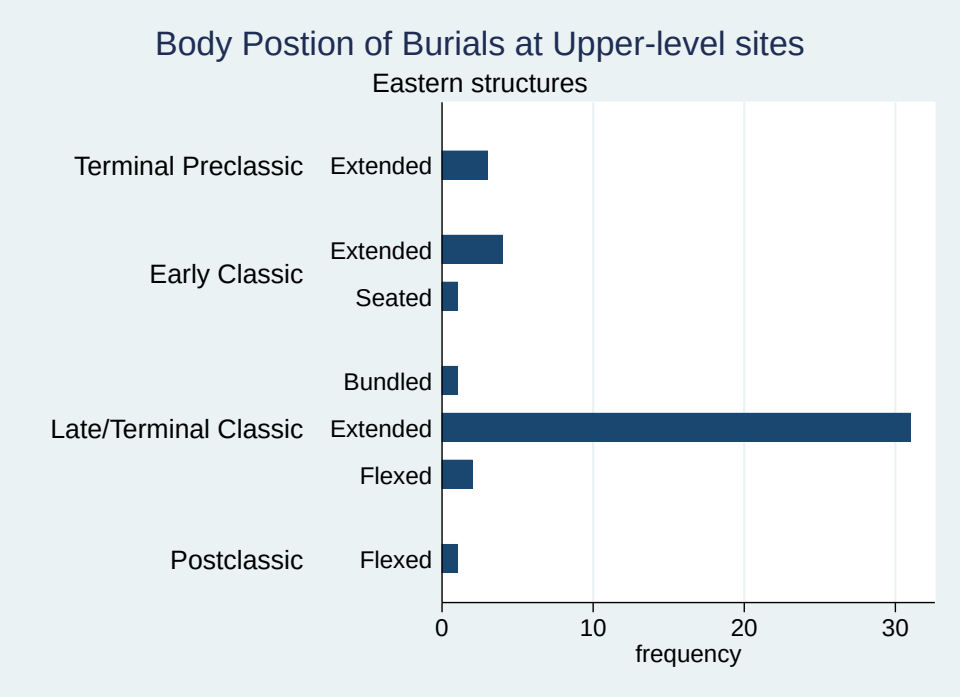

Figure 28. Body position over time at upper-level sites, eastern structures.

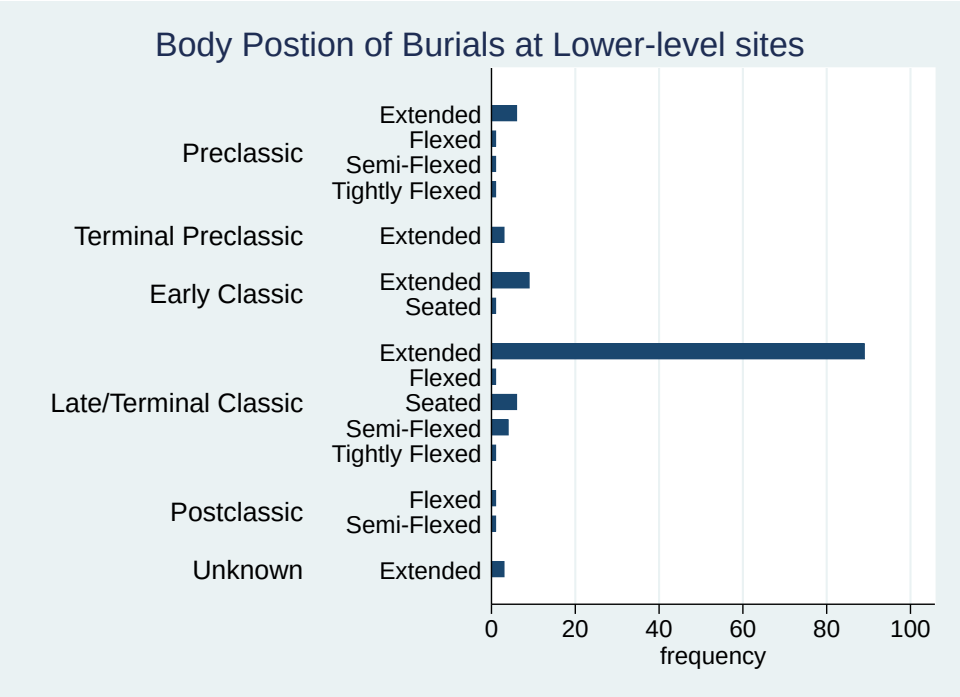

Figure 29. Body position over time at lower-level sites, all structures.

Form of disposal. In this section data are presented on the spatial and temporal distribution of primary and secondary burials in the Belize Valley. At each site type the predominant form of disposal was primary (Table 6, Appendix D). Secondary burials occurred at all site types in varying frequencies. Across site types, secondary interments were most commonly found in multiple individual burials (Table 13). A Pearson χ^2 test shows that the relationship is statistically significant (Table 13).

At mid-level sites, secondary burials were found throughout time and they occurred predominantly in structures that had a ritual function, including eastern structures (Figure 30-32). Secondary burials were most commonly found with multiple individual, primary interments at mid-level sites at a statistically significant level ($\chi^2 = 13.68$; $df = 1$; $p < 0.05$) (Figure 32).

At upper-level sites secondary burials were only found dating to the Late Classic period (Figure 33). As with other burial practices, the upper-level sites had secondary burials in a variety of ritual and non-ritual structures. Secondary burials were most commonly placed in eastern structures of upper-level sites (Figure 34). There were secondary burials at lower-level sites throughout time, although in general there were not many (Figure 35). There are actually the most secondary burials in the Preclassic period and the least in the Late Classic at lower-level sites, although the sample size is quite low (Figure 35).

In general, there are not many secondary burials at any of the site types. There were none at Upper level sites until the Late Classic period. The burial location of secondary interments differs between Upper and mid-level sites. At upper-level sites eastern structures contain more secondary burials (n = 6) while at mid-level sites plaza locales and eastern structures contain secondary burials (n = 1). There were very few secondary interments placed at lower-level sites. Multiple individual burials at mid-level sites more commonly contained secondary burials.

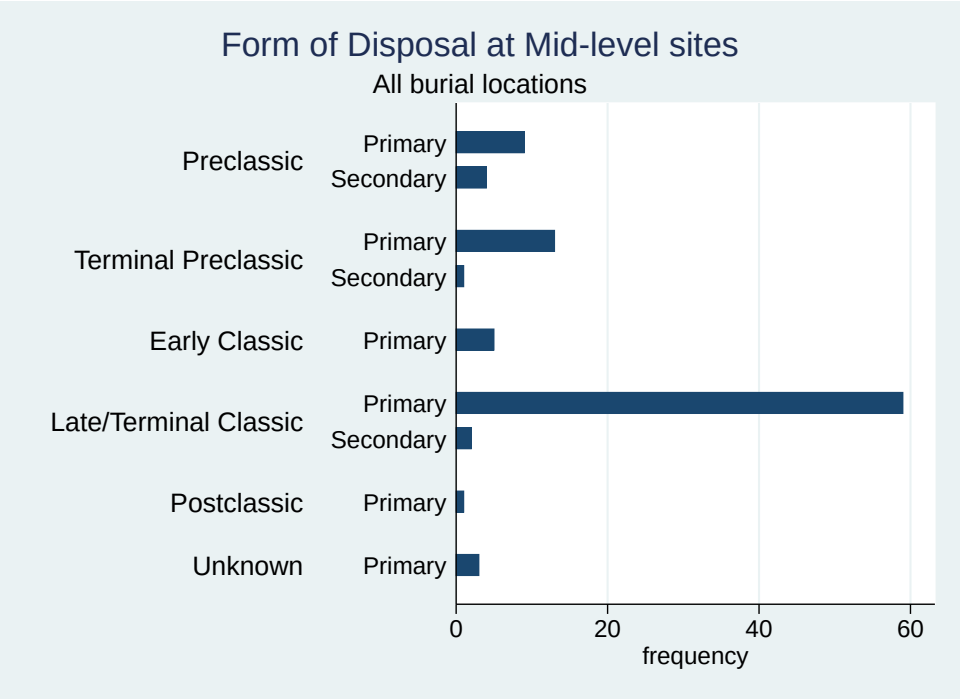

Figure 30. Form of disposal over time at mid-level sites, all structures.

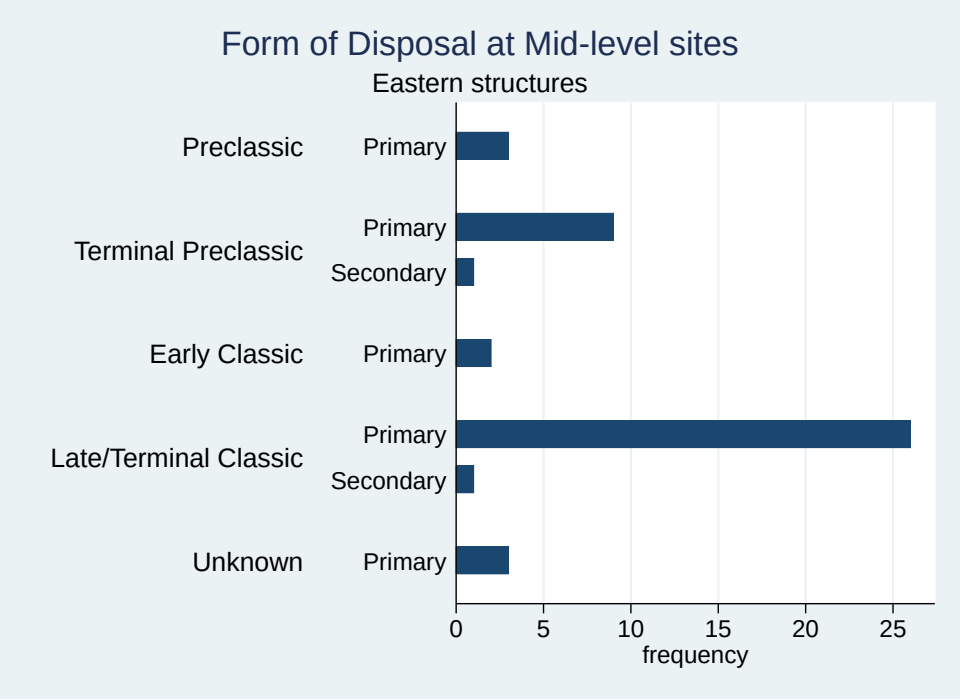

Figure 31. Form of disposal over time at mid-level sites, eastern structures.

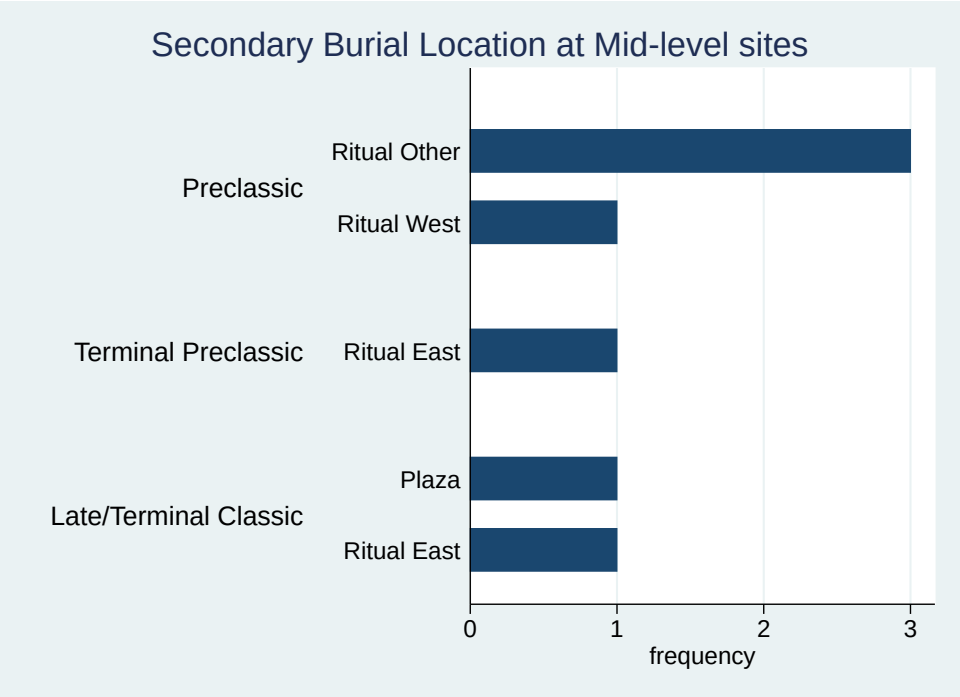

Figure 32. Secondary burial location over time at mid-level sites.

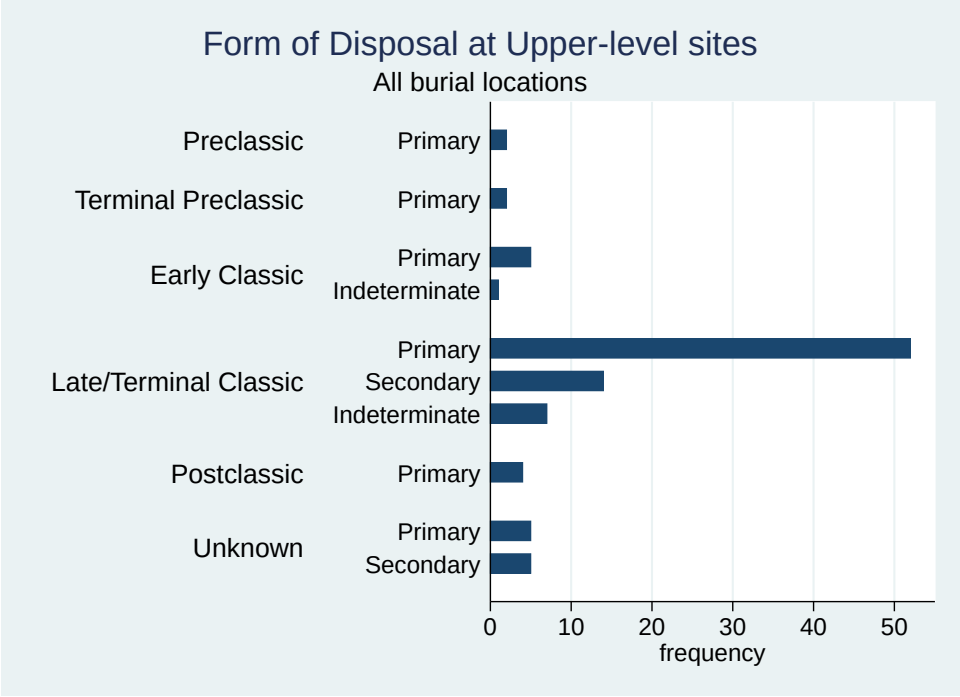

Figure 33. Form of disposal over time at upper-level sites, all structures.

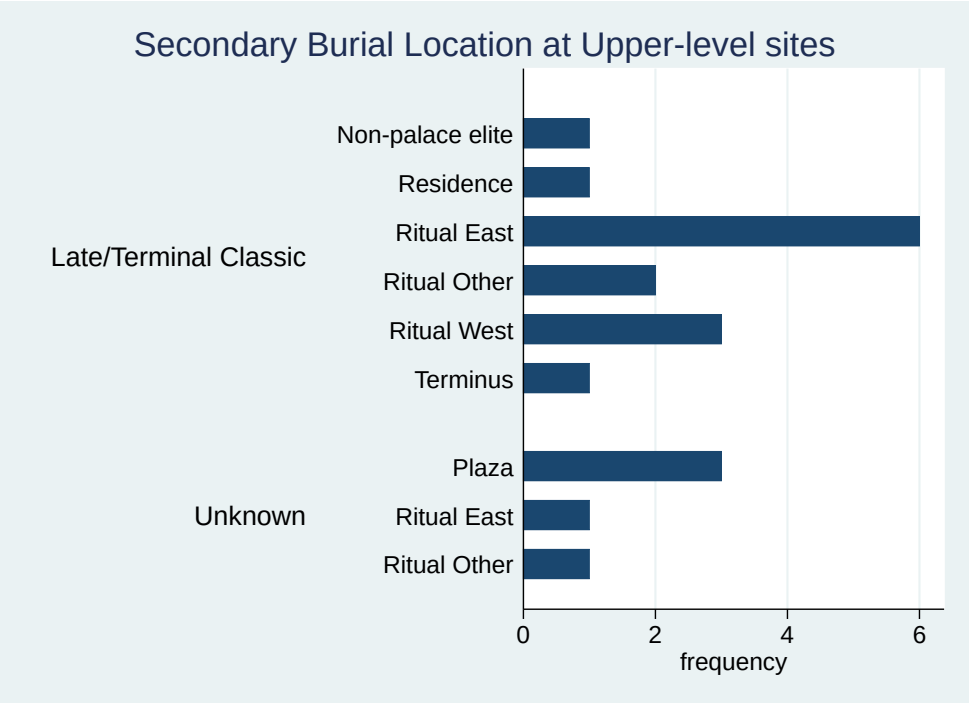

Figure 34. Secondary burial location over time at upper-level sites.

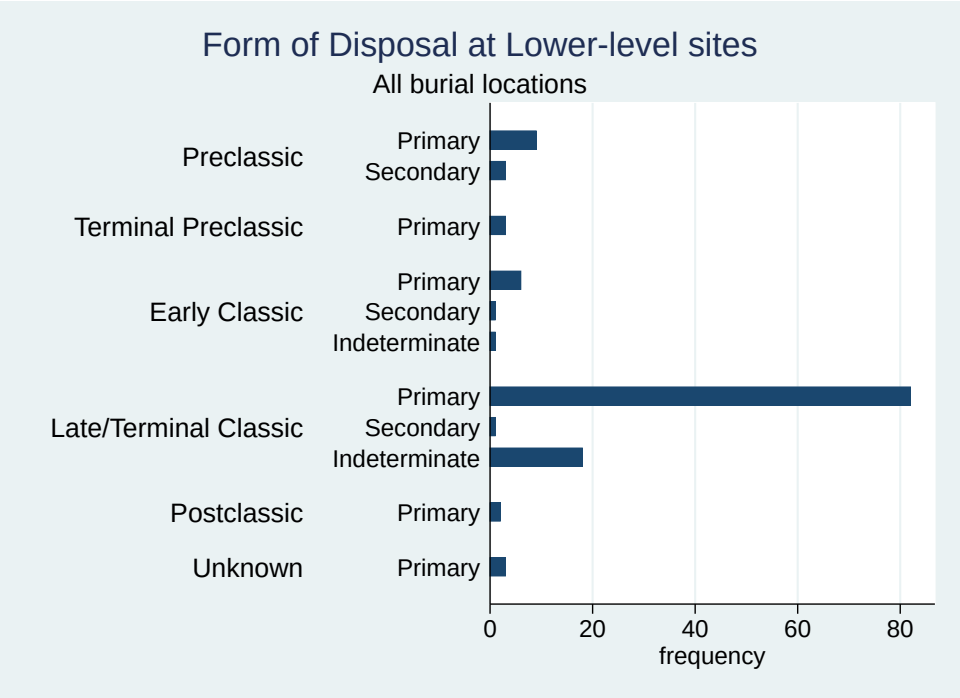

Figure 35. Form of disposal at lower-level sites, all structures.

Table 13. Occurrence of primary or secondary burials in multiple individual contexts.

Form of disposal	Multiple	Single	Total
Primary	36	165	201
Secondary	25*	10	35
Total	61	175	236

*χ^2= 44.54; *df*=1; *p*<0.05

Degree of Articulation. The degree of articulation refers to how well-articulated the bones were when excavated. The vast majority of burials in the Belize Valley were articulated when recovered (Table 6, Appendix D). At mid-level sites, the Preclassic period shows fewer articulated burials in relationship to disturbed and disarticulated; disarticulated burials were the most common at this time (Figure 36). In subsequent time periods articulated burials predominated. In eastern structures there were always more articulated burials over time than disarticulated and disturbed at mid-level sites (Figure 37). Disarticulated burials in eastern structures were more common than disturbed burials. In the Late Classic period, the time for which the sample sizes are the highest, crypts and cists were the types of graves that most often contained disarticulated and disturbed burials, discussed in more detail below.

Articulated burials always predominated through time at upper-level sites (Figure 38). In eastern structures of upper-level sites during the Late/Terminal Classic there seems to have been a greater occurrence of disarticulated and disturbed burials compared to the other site types (Figure 39). Articulated burials also predominated at lower-level sites (Figure 40). Disturbed and disarticulated burials occurred less frequently than at the

other site types. There is not a distinct pattern of disarticulated or disturbed burials based on structure or grave type at lower-level sites.

In sum, articulated burials predominated at all site types over time. Mid-level sites had fewer disarticulated or disturbed burials in eastern structures than expected. Disarticulated burials were more common in the Preclassic at mid-level sites. Eastern structures contained mostly articulated burials in all time periods at mid-level sites. This contrasts with upper-level sites, where in eastern structures there was a higher occurrence of disarticulated and disturbed interments when compared to other sites (Figure 38). Disturbed and disarticulated burials occurred least frequently at lower-level sites. Funerary space is considered next.

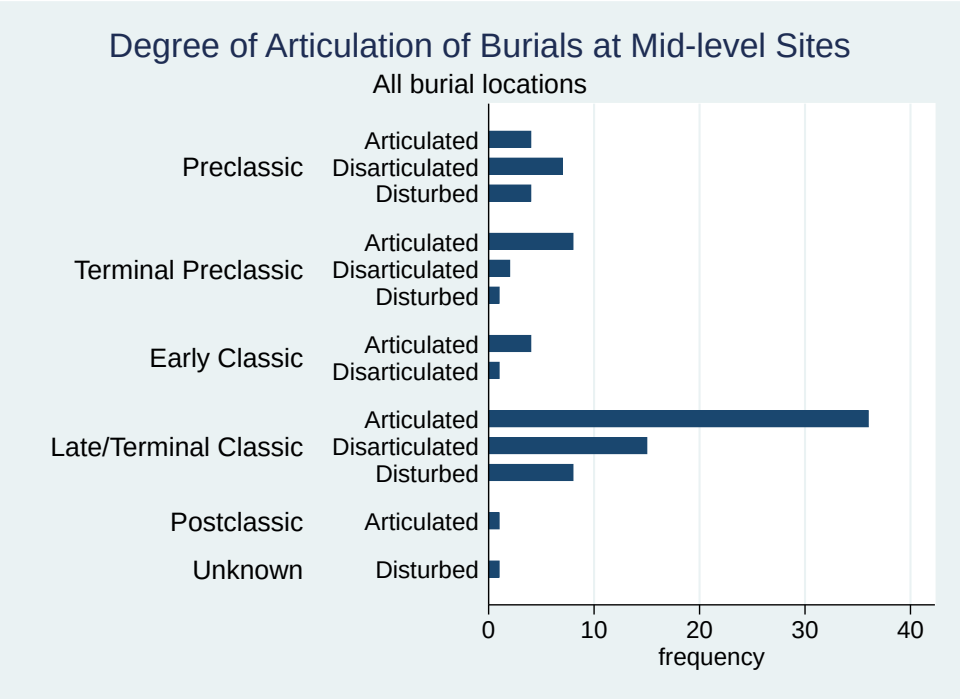

Figure 36. Degree of articulation over time at mid-level sites, all structures.

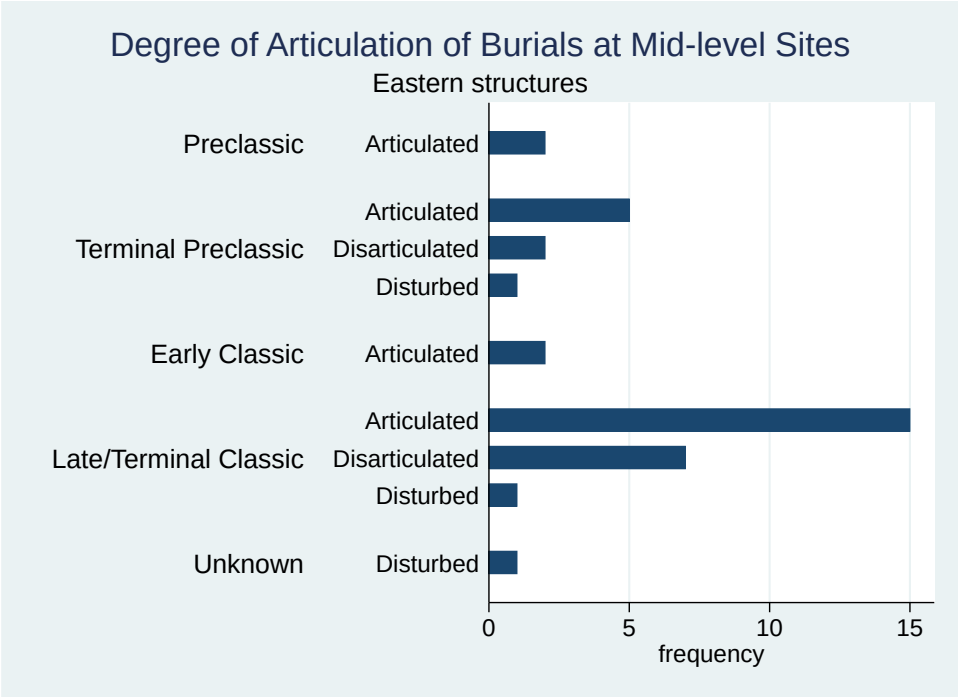

Figure 37. Degree of articulation over time at mid-level sites, eastern structures.

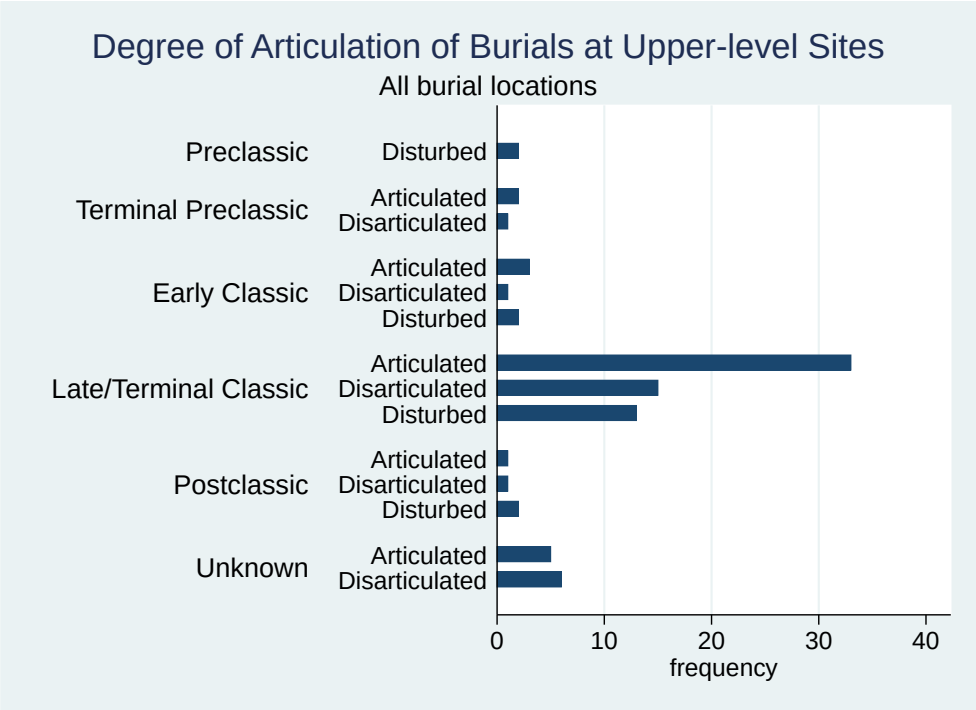

Figure 38. Degree of articulation over time at upper-level sites, all structures.

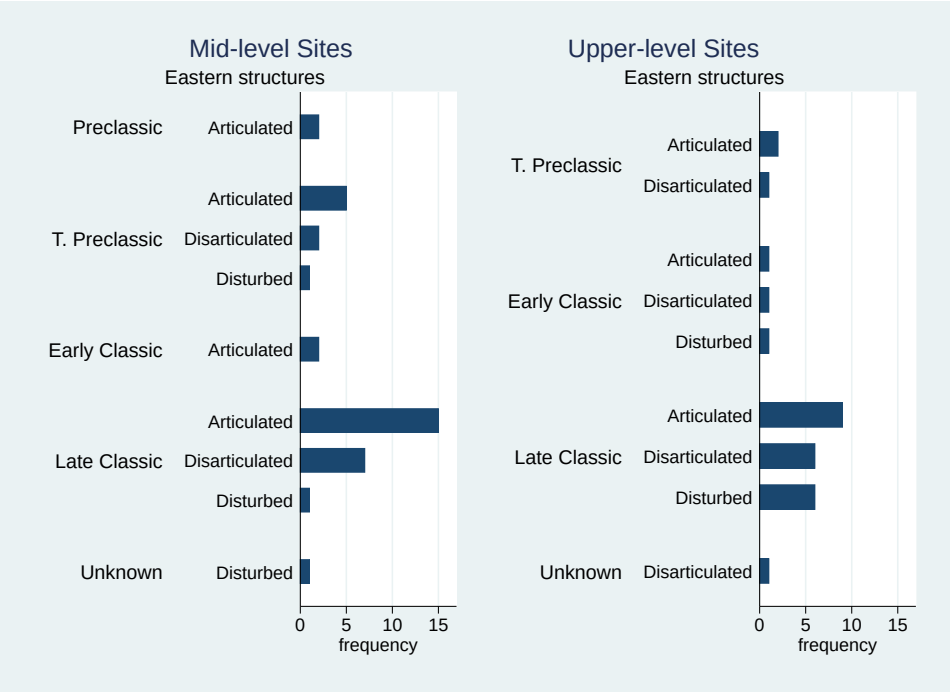

Figure 39. Comparison of degree of articulation over time at mid-level sites and upper-level sites, eastern structures

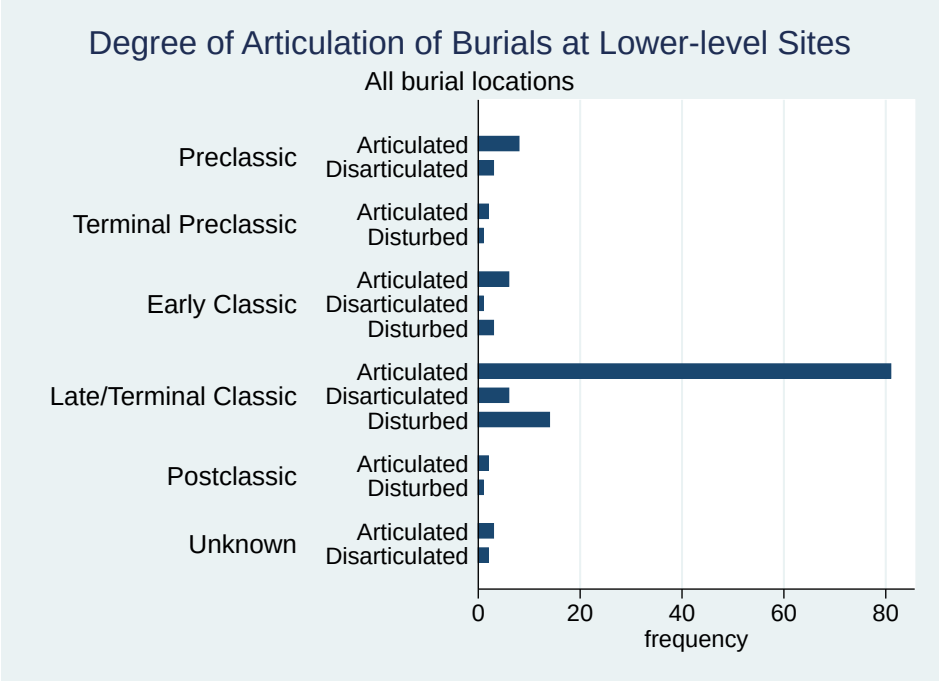

Figure 40. Degree of articulation at lower-level sites, all locations.

Funerary space. Funerary space refers to whether the grave space around the body was filled with soil after interment or not. Another possible variation in this category is that soil filtered in around the body and progressively filled the joint space as soft tissue decomposed. Skeletal elements will become displaced over the process of decomposition due to the forces of gravity and the position of the body if left in an open space (Duday 2011:34-38). Decomposition in filled space results in maintenance of articulation of all or most of the major joints in the body. As the flesh decomposes soil surrounds the bones and holds the elements in the position in which they were placed in the flesh (Duday 2011:38-40). The category Indeterminate means that there was a photo or drawing available but the degree of decomposition was unclear due to preservation or conflicting indicators.

It was not common for Belize Valley burial features to be left open (Table 6, Appendix D). Mid-level sites only have interments that were possibly left open. Preservation was too poor in many cases to determine if the context was left open based on the skeletal remains. The locations where possible open burials occur most frequently were eastern structures, with a few occurring in plazas (Figure 41,42).

Open burials do not occur at upper-level sites until the Late/Terminal Classic period (Figure 43). These types of interments occurred within residences and eastern structures. Open graves were never observed at lower-level sites (Figure 44).

In sum, leaving a funerary context unfilled was not common in the Belize Valley. Open burials did occur most frequently in eastern structures at mid-level sites. At upper-level sites, they occur in eastern structures and residences, consistent with other results that show more variability at upper-level sites. Multiple individual burials were more

likely than single individual burials to have been left open. Individuality is considered next.

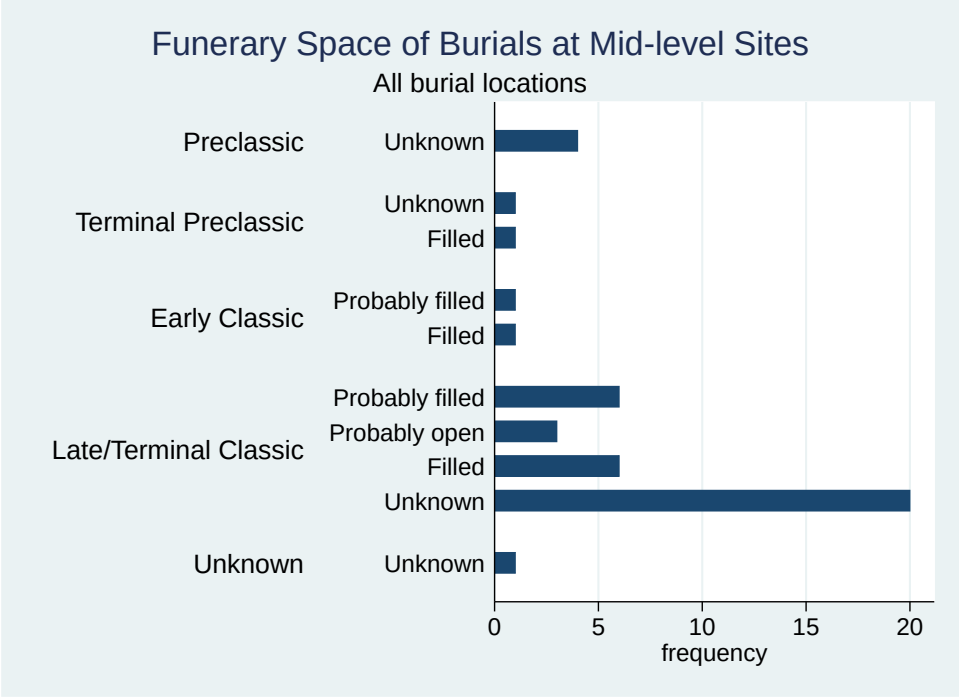

Figure 41. Funerary space over time at mid-level sites, all structures.

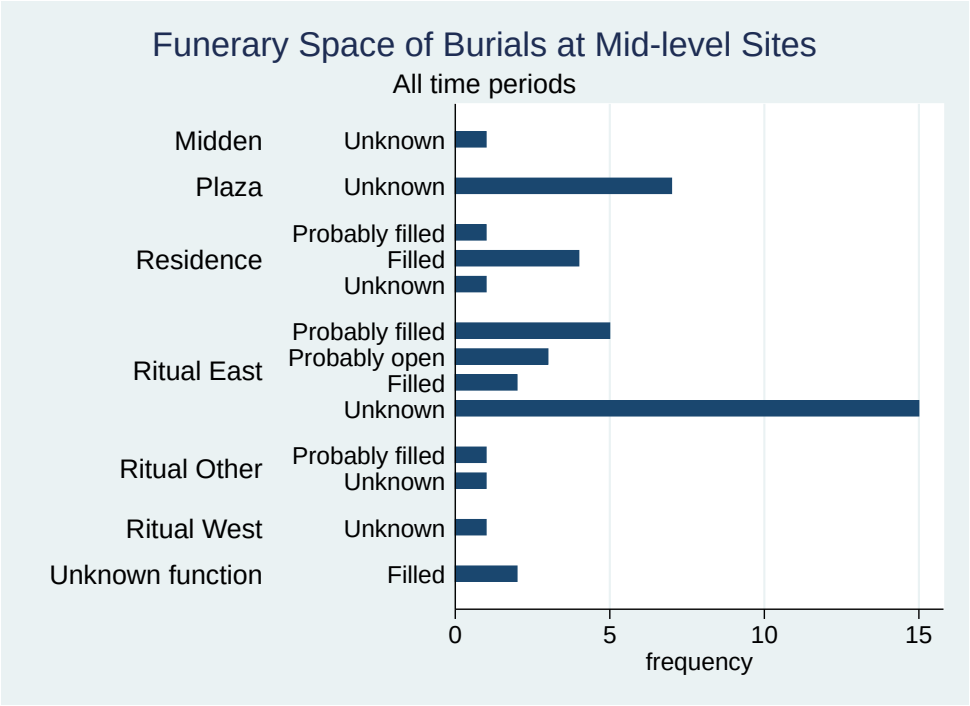

Figure 42. Funerary space at mid-level sites by burial location, all time periods.

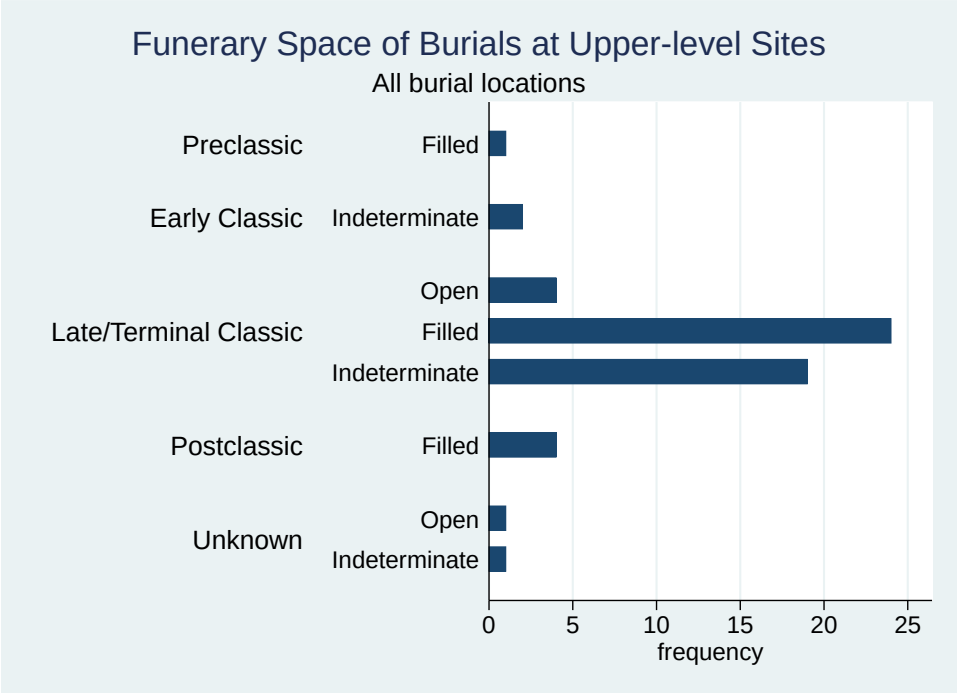

Figure 43. Funerary space over time at upper-level sites, all structures.

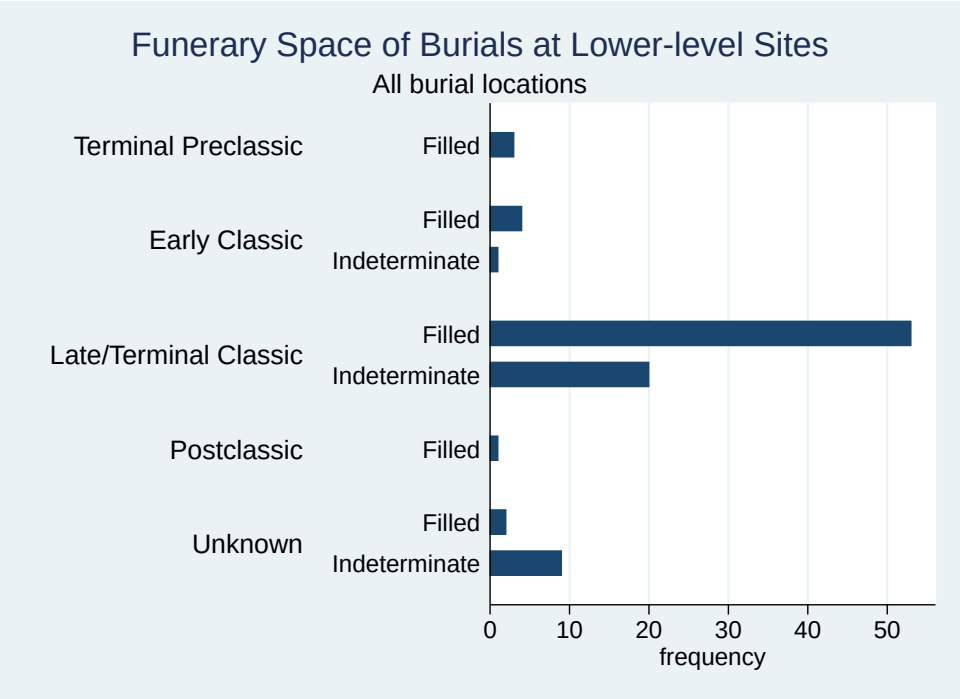

Figure 44. Funerary space over time at lower-level sites, all structures.

Individuality analysis. Individuality refers to the number of individuals in each grave context (Sprague 2005). Belize Valley burials, considered as a whole were typically single individual interments (Table 6 Appendix D).

At mid-level sites, when comparing all burials locations, single individual burials predominated over time (Figure 45). Within eastern structures there were no multiple individual burials until the Terminal Preclassic. Multiple individual burials were more common in the Late/Terminal Classic (Figure 46). Multiple individual burials were most commonly interred in ritual structures at mid-level sites, particularly eastern structures in the Late/Terminal Classic period (Figure 46).

Multiple individual burials in Upper level sites were more common later in time; there were no multiple individual burials dating to the Preclassic or Terminal Preclassic (Figure 48, 49). There were more single individual interments in eastern structures at

upper-level sites, in general (Figure 49).

Multiple individual burials seemed to be most common in eastern structures starting in the Classic period at all site types. There were no multiple individual burials at Upper level sites before the Classic period when all structures are considered. There were multiple individual burials interred at mid-level sitesin the Preclassic and Terminal Preclassic periods (n=7). Lower-level sites showed a pattern closer to mid-level sites with multiple individual interments beginning in the Preclassic period (Figure 50). Mortuary facilities are considered next.

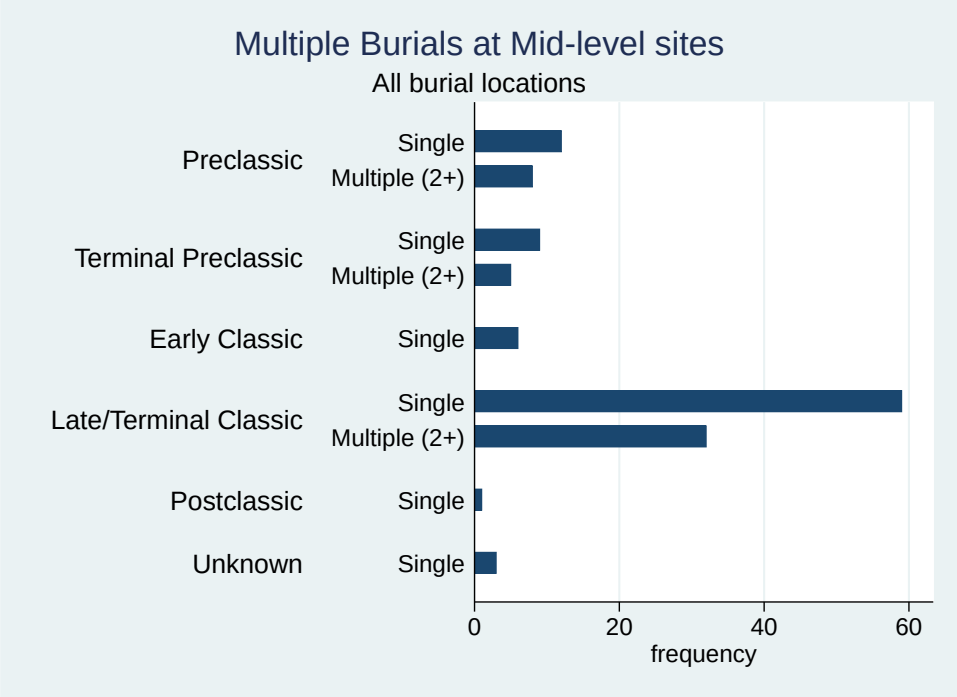

Figure 45. Multiple burials over time at mid-level sites, all structures.

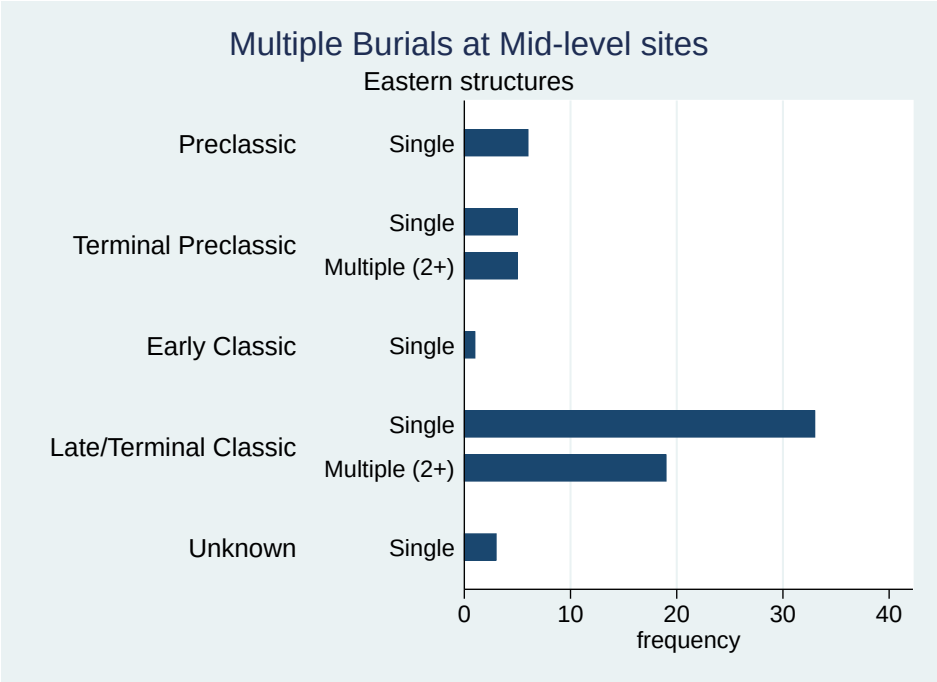

Figure 46. Multiple burials over time at mid-level sites, eastern structures.

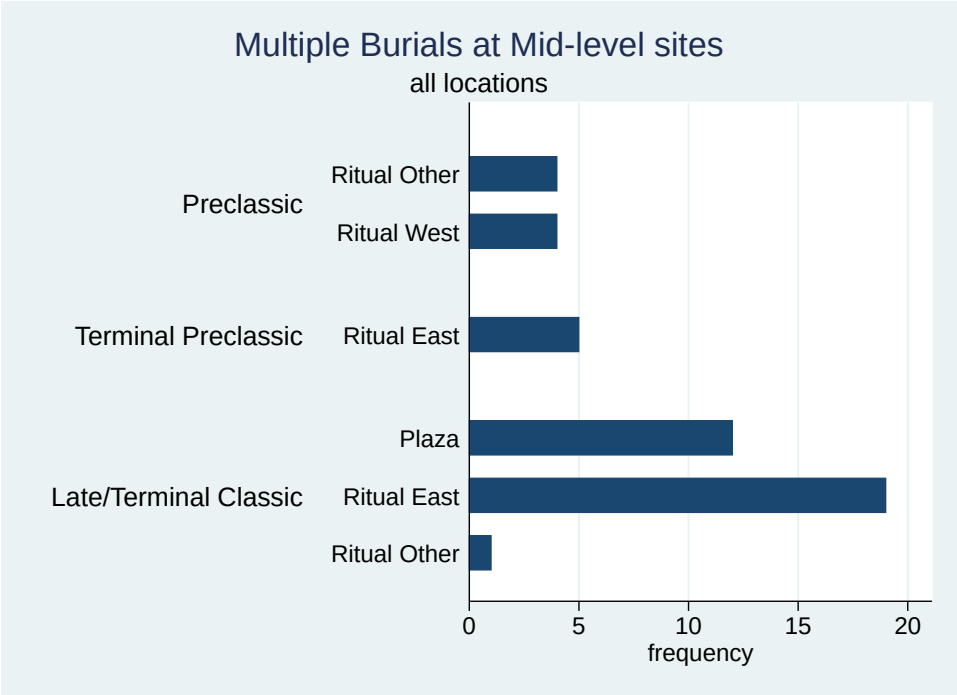

Figure 47. Multiple burials over time at mid-level sites, by structure type.

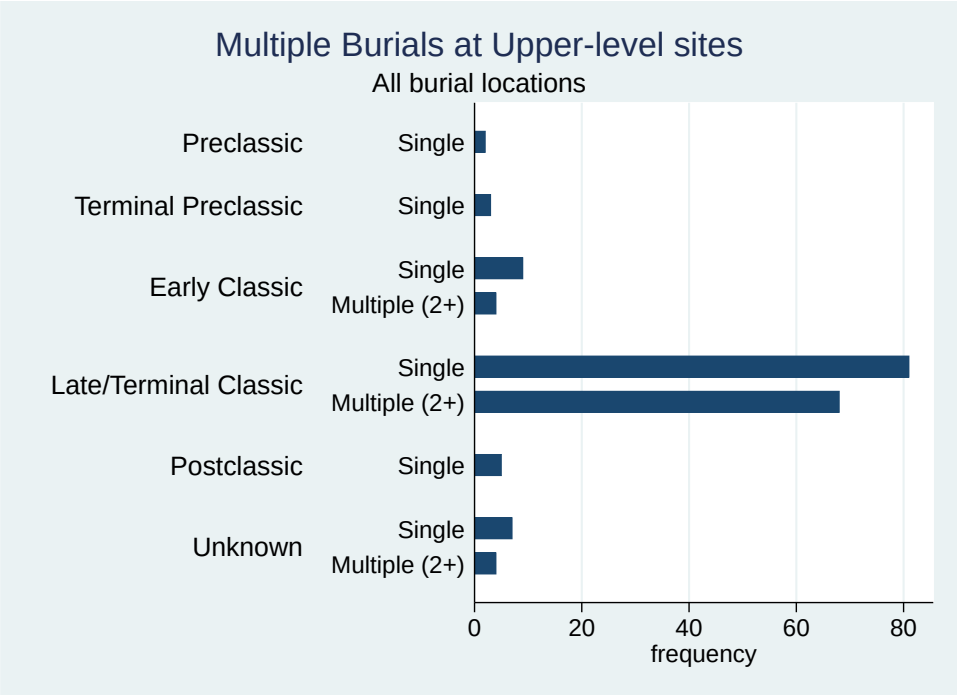

Figure 48. Multiple burials over time at upper-level sites, all structures.

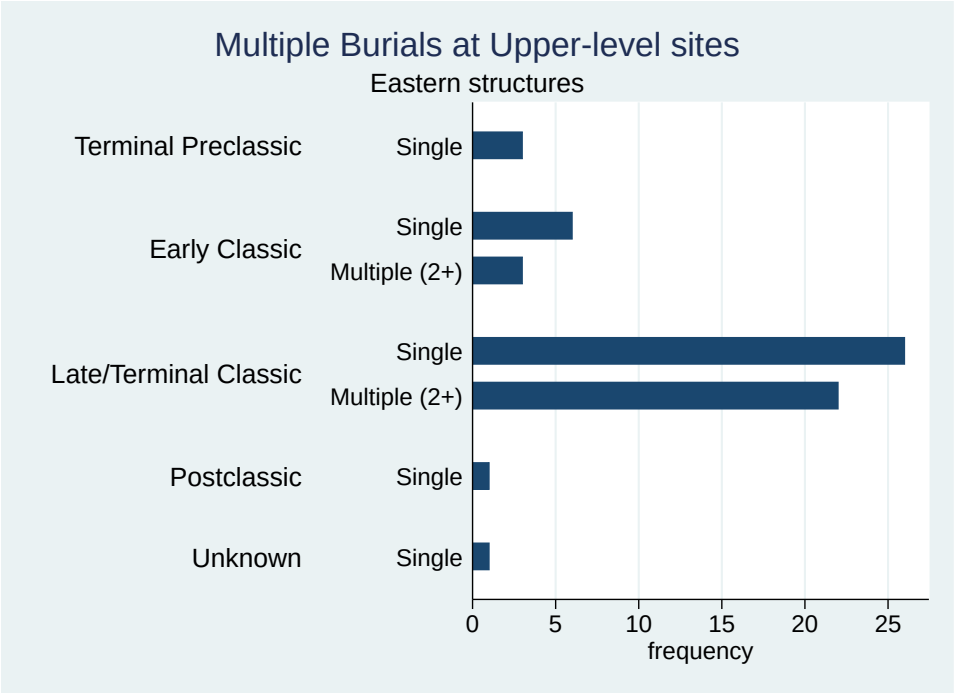

Figure 49. Multiple burials over time at upper-level sites, eastern structures.

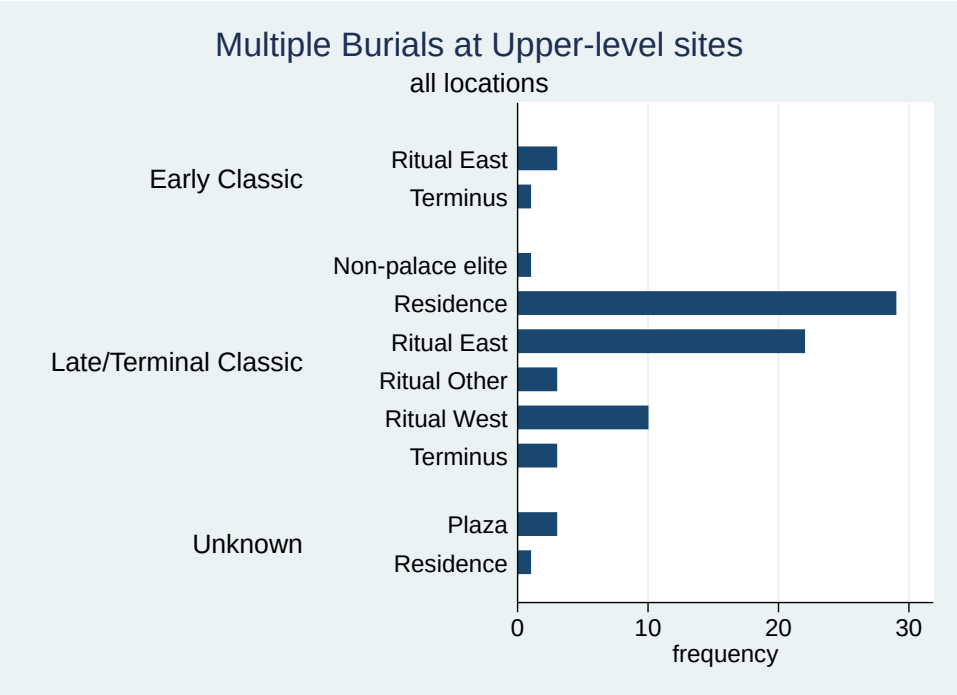

Figure 50. Multiple burials over time at upper-level sites, all structures.

Mortuary Facilities

Variation in mortuary facilities is first assessed using Multiple Correspondence Analysis (Figure 50). Clustering is clearly not that apparent. However, mid-level sites, upper-level, and lower-level sites are each associated with a quadrant of the plot and it is clear that there are some site-types and facilities associated with each. Starting in the upper left hand corner lower-level sites, indicated by the blue circle, are associated with interment in residences as well as simple grave types. Moving counter-clockwise to the green circle, upper-level sites are associated with platform burial contexts, palace and non-palace elite burial locations. The origin line shows some variation in burial structure type and grave type. Terminus structures, ritual structures located on the western side of plaza groups, and tombs occur infrequently are group along dimension 2. The upper right hand quadrant shows mid-level sites group loosely with plaza burials, crypts, and

interment in eastern structures, indicated by the red circle. These associations are explored in more detail below.

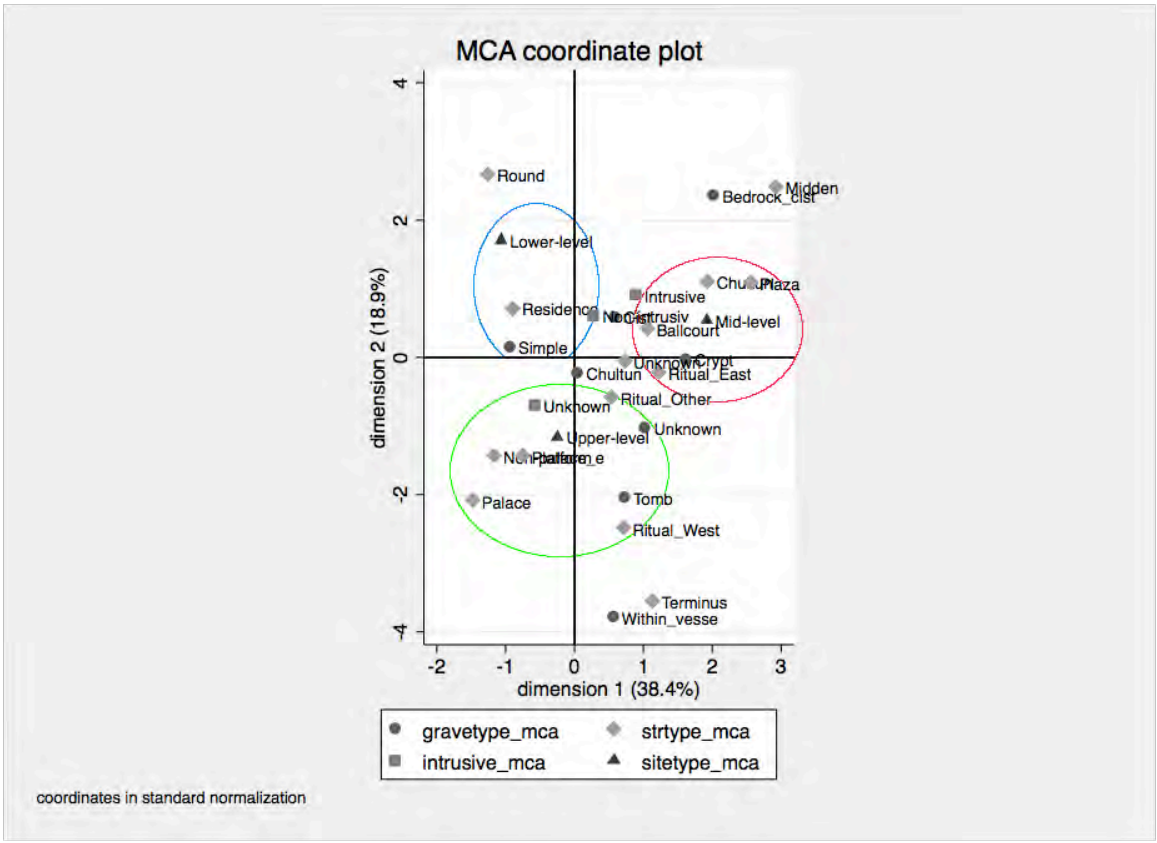

Figure 51. MCA scatterplot of mortuary facilities and site types.

Grave type. To describe the burials analyzed in this study, Welsh's (1988:16-18) grave types were used, which he compiled from 16 sites and 1100 burials. His typology is thorough, although not exhaustive. Welsh's monograph and grave typology have been used routinely by field archaeologists in the Maya region to categorize grave architecture. As I compiled results it became clear that the amount of variation in the Maya area was potentially confounding. Clearly most graves were simple, unlined and uncapped pits dug into architectural fill, but the detail in the typology obscured data at the level of slightly

more elaborate architecture. I returned to Welsh's typology and reduced the variability to his main types – simple, cist, crypt, tomb, chultun. I also included bedrock cists as a separate category, as well as burials that occurred within vessels, which were infrequent. The reader may refer to Appendix B for details of Welsh's typology.

One goal of this dissertation is to gain an understanding of whether mid-level leaders engaged in protracted relationships with the skeletal remains of those interred in eastern structures. One way they could have done this is by interring those in eastern structures in graves that were easy to return to and to open. Thus, I might expect more crypt-type graves in an eastern structure because they tend to be capped with stones, rather than a cist or simple grave that is not. Of course, capstones are not the only way that a grave can be marked, and indeed it seems that the Maya may have marked graves with only a few stones.

Simple graves were by far the most frequent grave types in the Belize Valley in general. However, mid-level sites depart from the pattern slightly. Crypts and cists were nearly equal in frequency at mid-level sites (Table 6, Appendix D) and consistently appeared through time (Figure 52). In eastern structures, grave types varied early in time and cists and crypts were common in the Late/Terminal Classic (Figure 52). However, crypts were more frequent in non-eastern structures (n=20) than eastern structures (n=14) (Figure 46). In the Late/Terminal Classic period, grave elaboration was similar between eastern and non-eastern structures. There were fewer simple graves in eastern structures, however. Table 4 shows that degree of disarticulation of the skeleton was more common in crypts, which by definition have capstones.

Upper-level sites presented a greater variety of grave types when compared to

mid-level sites and lower-level sites, particularly in the Late/Terminal Classic (Figure 53). Simple graves were most common in eastern structures in the Late/Terminal Classic, although cists and crypts were also present. Non-eastern structures follow a similar pattern in grave types, although more tombs were found in non-eastern structures during this time period. Simple graves predominate at lower-level sites through time (Figure 54). However, there was more variety in the Late Classic as there was at other site types.

In sum, mid-level sites show variety in grave type early in time. In the Late/Terminal Classic, when all structures are considered, grave types are more consistently crypts and cists. Simple graves were not as common in eastern structures in the Late/Classic as in non-eastern structures, suggesting some degree of mortuary elaboration and expenditure for individuals buried in eastern structures. There was a lot of variety during all time periods in upper-level sites. It is interesting that eastern structures contained more simple graves than any other type in the Late/Terminal Classic at upper-level sites. Consistent with other variables, there was more variation in non-eastern structures than in eastern structures in the Late/Terminal Classic at upper-level sites. Simple graves predominate at lower-level sites.

Table 14. Grave types by site type, all time periods.

Grave Type	Lower-level	Mid-level sites	Upper-level	Total
Bedrock cist	1	4	1	6
Chultun	0	2	5	7
Cist	22	45	32	99
Crypt	7	50	42	99
None	1	0	0	1
Simple	126	21	68	215
Tomb	0	0	14	14
Within vessels	1	0	9	10
Total	158	122	171	451

Table 15. Grave types at mid-level sites compared to the degree of articulation of the skeleton.

	Bedrock cist	Chultun	Cist	Crypt	Simple	Unknown	Total
Articulated	3	0	14	20	12	4	53
Disarticulated	0	1	3	18	1	2	25
Disturbed	1	1	3	**6**	3	0	14
Total	4	2	20	44	16	6	92

Table 16. Funerary space compared to grave type. Open graves were most commonly grave types that were easy to access.

Funerary space	Bedrock cist	Chultun	Cist	Crypt	Simple	Tomb	Unknown	Total
Filled	2	0	25	18	76	0	1	122
Open	0	2	0	**5**	0	3	0	10
Total	4	5	41	52	122	5	3	232

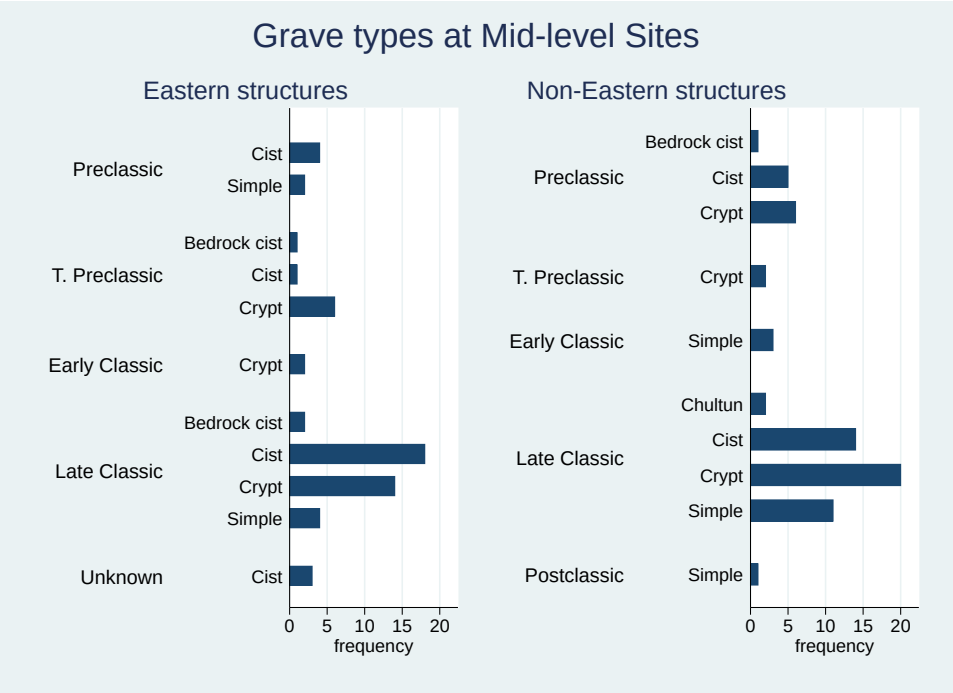

Figure 52. Grave types over time at mid-level sites, eastern and non-eastern structures.

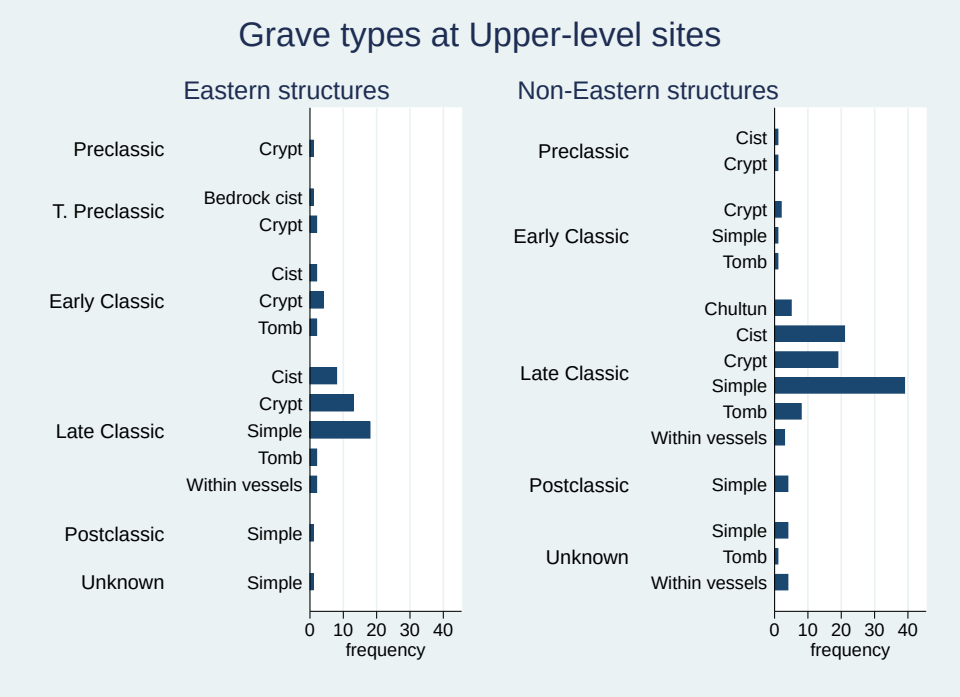

Figure 53. Grave types over time at upper-level sites, eastern and non-eastern structures.

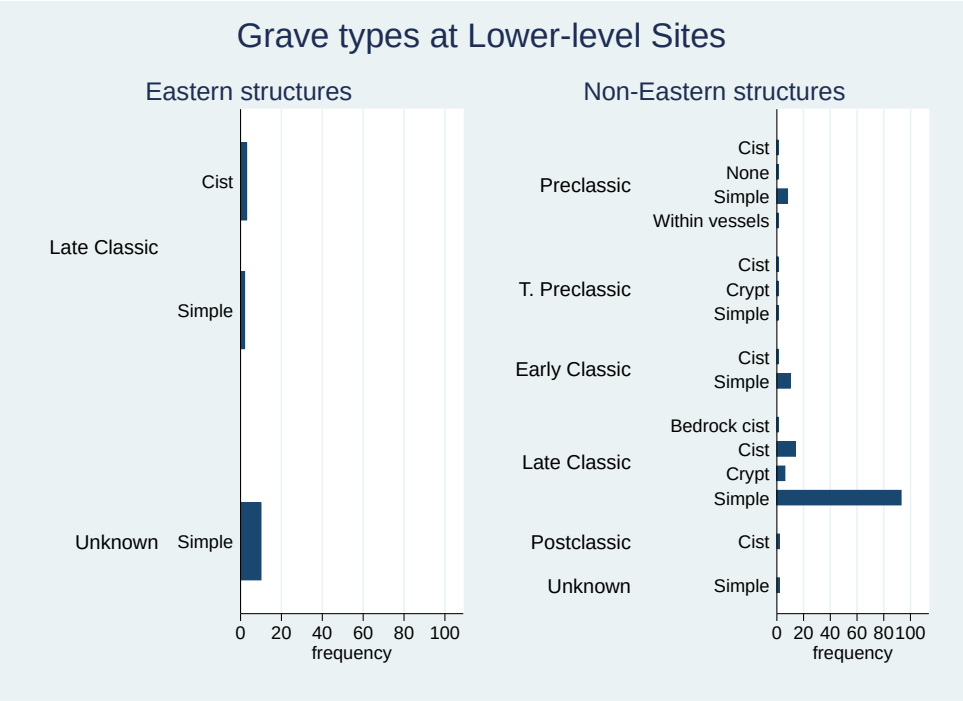

Figure 54. Grave types over time at lower-level sites, eastern and non-eastern structures.

Intrusiveness. This study addresses whether burials in eastern structures were more often intrusive into established architecture or if they were interred as part of a building episode. Many archaeologists suggest that burials were interred during the construction of or additions to a building (McAnany 2013; Welsh 1988). However, this has not been systematically addressed. More than half of the burials in the Belize Valley are intrusive (56.9%, Table 6, Appendix D).

At mid-level sites, in all burial locations, intrusive burials were always more common than non-intrusive burials throughout time, with the exception of the Early Classic period (Figure 54). During the Early Classic period the sample size is low, but non-intrusive burials (those put in during building construction) were more common than intrusive burials. At mid-level sites eastern structures more commonly contain intrusive burials than non-intrusive burials throughout time. Grave type was also

tabulated according to intrusiveness (Figures 55, 58). Crypts and cists were commonly intrusive at mid-level sites.

Intrusive burials were more common at Upper level sites in general (Figure 56, 59). When all burial locations are considered non-intrusive burials were more common at upper-level sites in the Preclassic and intrusive burials were more common in the Early and Late/Terminal Classic periods. In eastern structures at upper-level sites non-intrusive burials were more common than intrusive burials in all time periods, except during the Postclassic period. As for grave type, simple graves were also commonly non-intrusive at upper-level sites, when all time periods are considered. Intrusive burials were generally more common at lower-level sites, except in the Preclassic period (Figure 57). Simple graves were commonly intrusive at lower-level sites, while crypts and cists were not.

In sum, patterns with respect to intrusiveness show that at mid-level sites, given all burial locations, intrusive burials were more common at all times. The opposite was true at upper-level sites, when all burial locations are taken into account; non-intrusive burials were more common than intrusive during all time periods. Eastern structures at mid-level sites through time contained predominantly intrusive burials, consistent with burial patterns at other structures at mid-level sites. However, non-intrusive burials were more common at upper-level sites in eastern structures. Simple graves were typically non-intrusive at mid-level sites and upper-level sites, while they were more often intrusive than non-intrusive at lower-level sites.

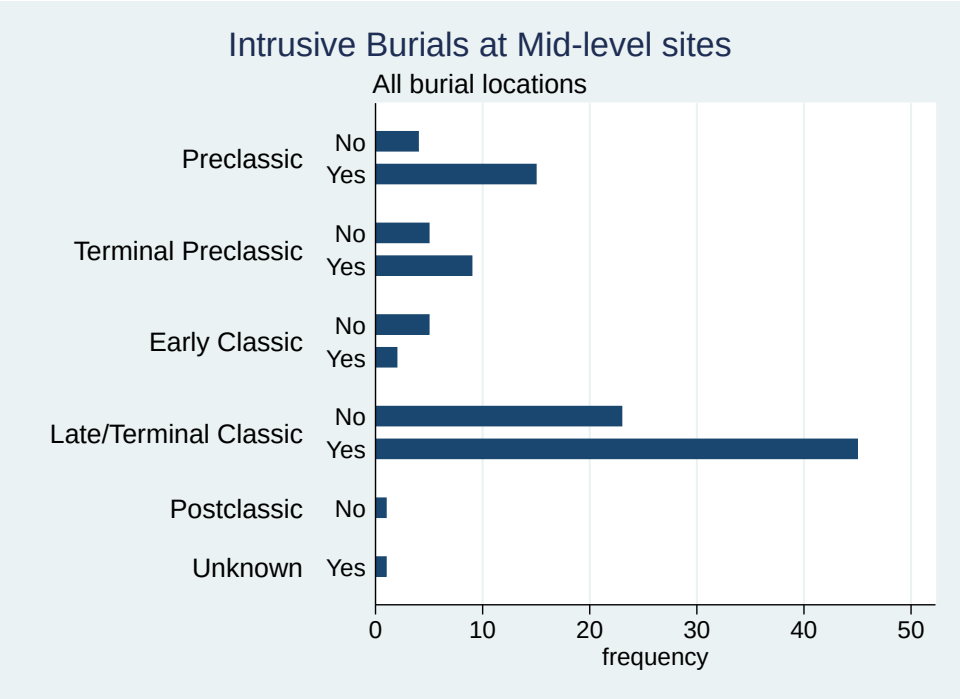

Figure 55. Intrusive burials over time at mid-level sites, all structures.

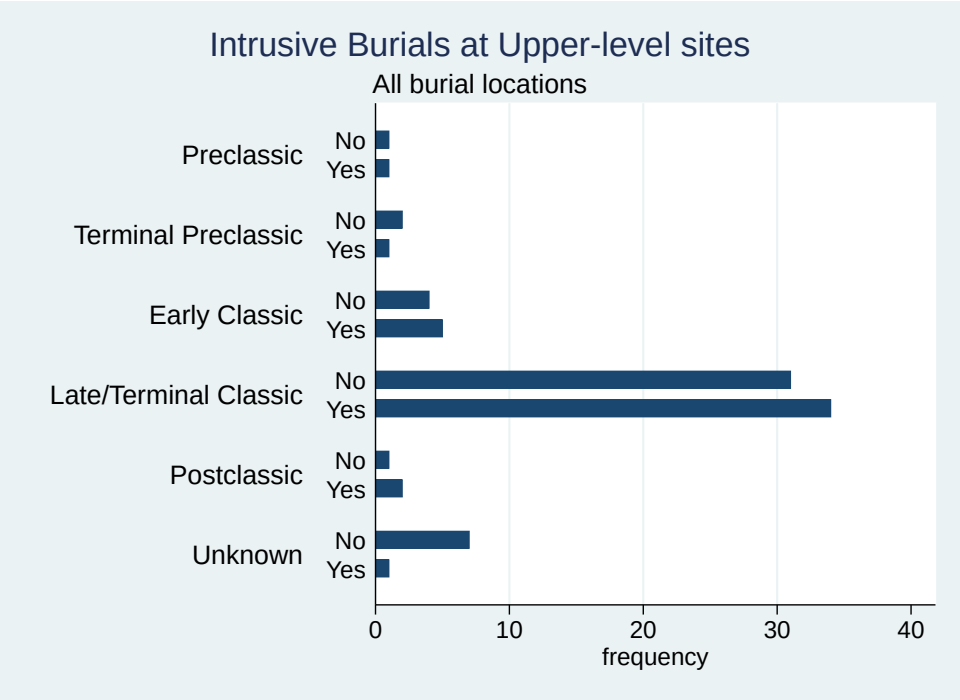

Figure 56. Intrusive burials over time at upper-level sites, all structures.

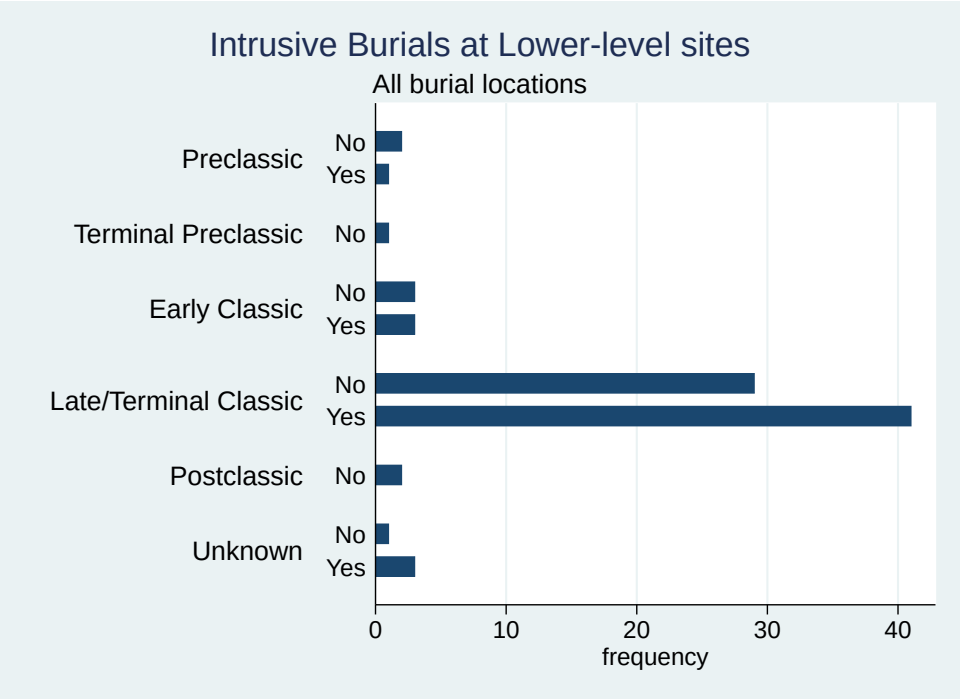

Figure 57. Intrusive burials over time at lower-level sites, all structures.

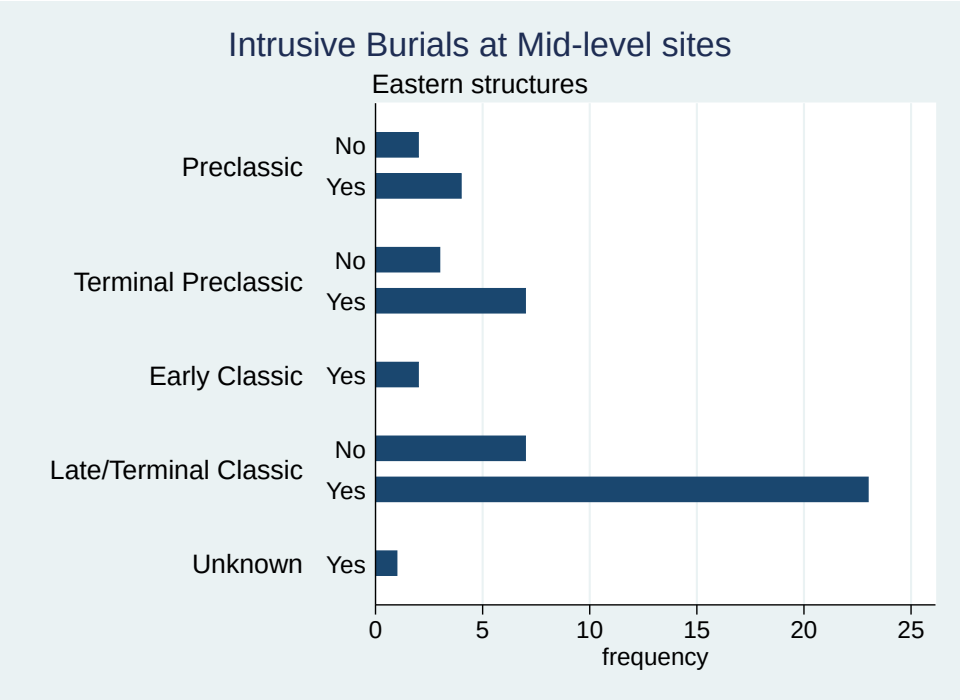

Figure 58. Intrusive burials over time at mid-level sites, eastern structures.

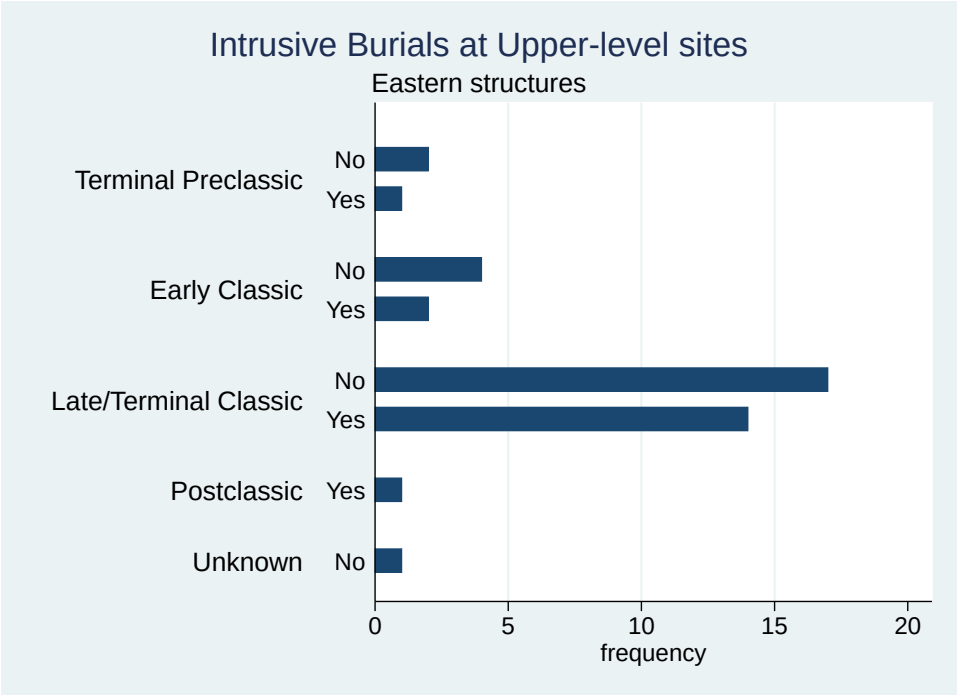

Figure 59. Intrusive burials over time at upper-level sites, eastern structures.

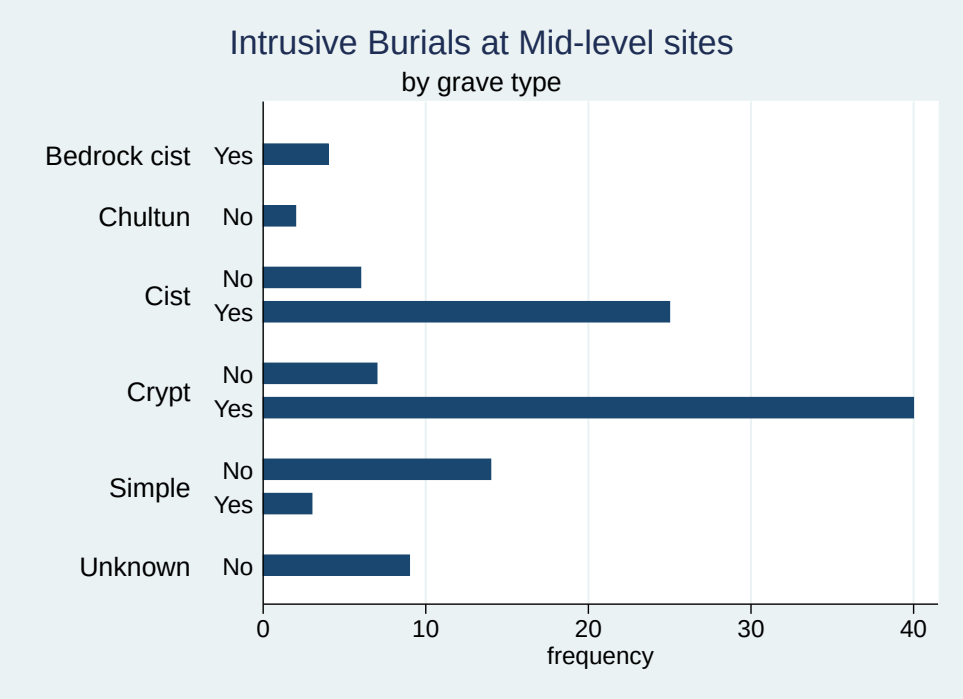

Figure 60. Intrusive burials over time at mid-level sites, by grave type, all time periods.

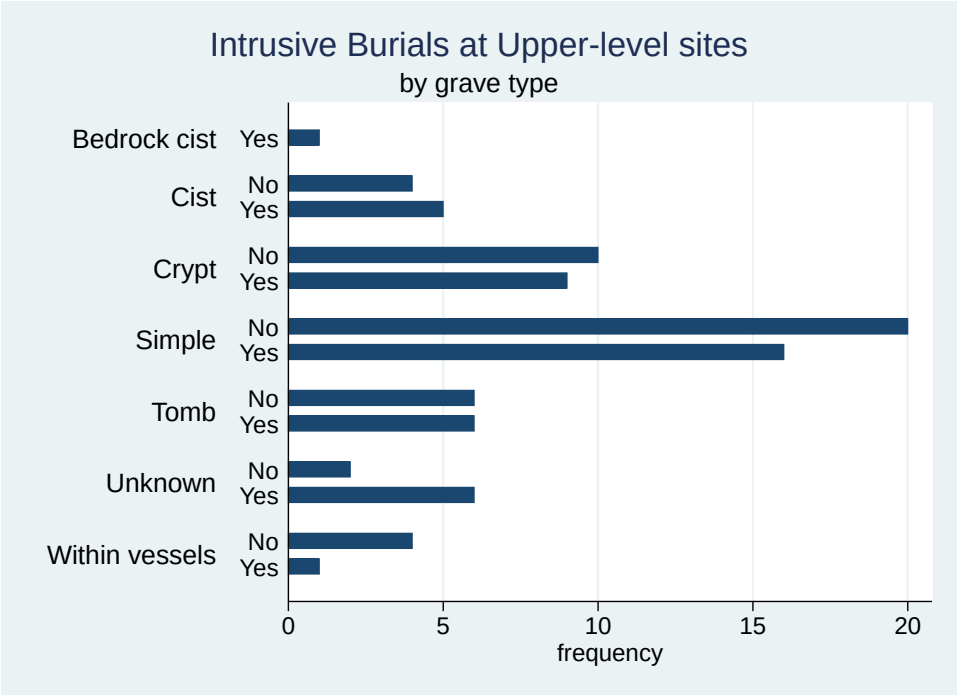

Figure 61. Intrusive burials at upper-level sites, by grave type, all time periods.

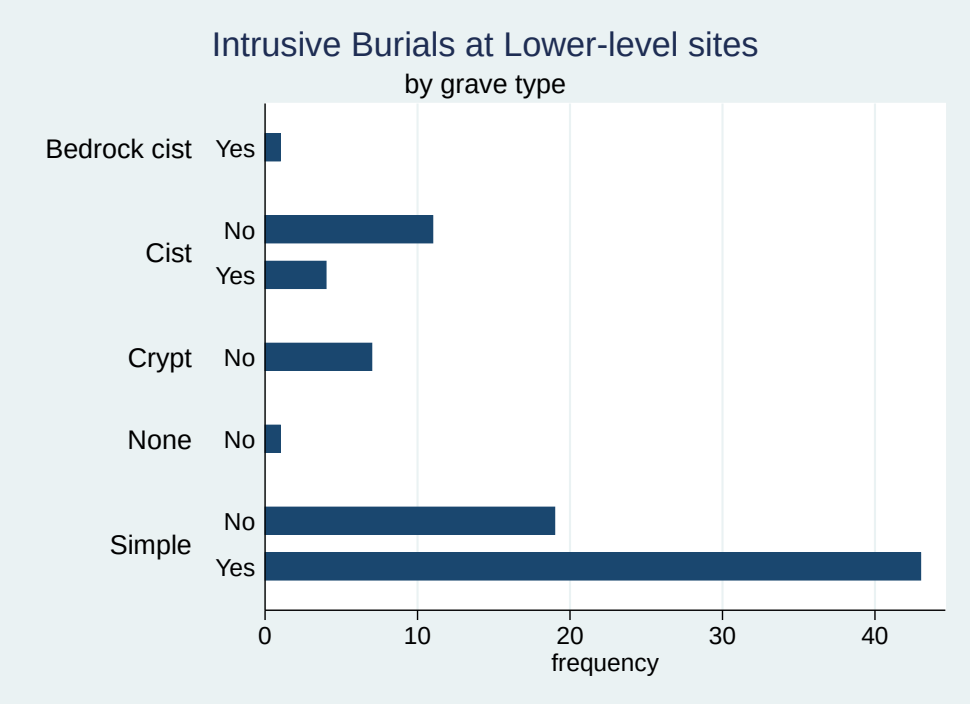

Figure 62. Intrusive burials at lower-level sites, by grave type, all time periods.

Age and Sex

One aspect of Expectation 2, as outlined in Chapter 4, is that interment in an eastern structure, an ancestral locale, may be expected to vary according to age and sex. In particular, older adult males may have most commonly been conceived of as ancestors. The MCA scatterplot that included nearly all mortuary data collected for mid-level sites did not show much patterning with respect to age and sex (Figure 12). Males and females grouped closely together as did all adults. Adolescents and juveniles did not cluster with the adults. In particular, adolescents appeared to be more closely associated with eastern structures.

In the following section sex and age are explored in more detail with regards, first, to body treatment and, second, to burial facility. A subset of the original data set is used. The MCA plot of all mortuary variables (Figure 12) showed sex and age clustering closely with the most common mortuary traits in the Belize Valley – prone deposition, extended position, and head to the south. Proximity of demographic variables with these mortuary traits in the MCA plot suggests that these variables were not specific to age or sex. These variables (deposition, position, and head orientation) were omitted from the following analysis.

Previous analyses showed that there are several characteristics of the Belize River Valley, prone deposition, head to the south and extended position, from which sex and age did not diverge in the MCA scatterplot presented at the beginning of the chapter (Figure 12). They also do not contribute new information to determining the variation present in eastern structures compared to non-eastern structures at different site types. Funerary space is consistently filled and nearly never left open, so it is also left out of the

variable list here. Thus, these variables are not presented as part of the analysis on age and sex. Variables included for body treatment are disposal, individuality, and articulation. Variables presented to address differences in burial facilities include structure type, grave type, and intrusiveness. Second, only data from the Late Classic period are presented. Due to preservation issues the data are sparse from earlier time periods so meaningful comparisons are not possible. Data on sex is present first followed by age.

Sex: Body treatment. Correspondence analysis (CA) was used to assess relationships between sex and differential body treatment. CA is similar to MCA but it tests the association between two, rather than multiple variables. The plots are easier to read with fewer variables, especially for this data set, for which there are many variable states.

Comparison of sex with respect to degree of articulation at mid-level sites suggests that males are more often articulated in eastern structures and females are more often disarticulated (Figure 63). However, this is not significant at the $p < 0.05$ level ($\chi^2 = 6.08$; $df = 9$; $p = 0.657$). Within non-eastern sites, females cluster more closely with disturbed interments, which are typically secondary burials, males cluster loosely with both articulated and disarticulated interments (Figure 64). An association between sex and structure type is not significant at the $p < 0.05$ level ($\chi^2 = 4.81$, $df = 6$, $p = 0.568$).

At upper-level sites within eastern structures, both males and females cluster close to disturbed interments (Figure 65). Association between sex and articulation in eastern structures of upper-level sites is not significant at the $p < 0.05$ level ($\chi^2 = 7.09$; $df = 9$; $p = 0.628$). In structures that are not eastern, both males and females cluster closely with

articulated (Figure 66). There is not a statistically significant association between sex and articulation within non-eastern structures $p < 0.05$ level (χ^2 =20.6; df = 9; p = 0.015) Patterning is less clear at lower-level sites (Figure 67).

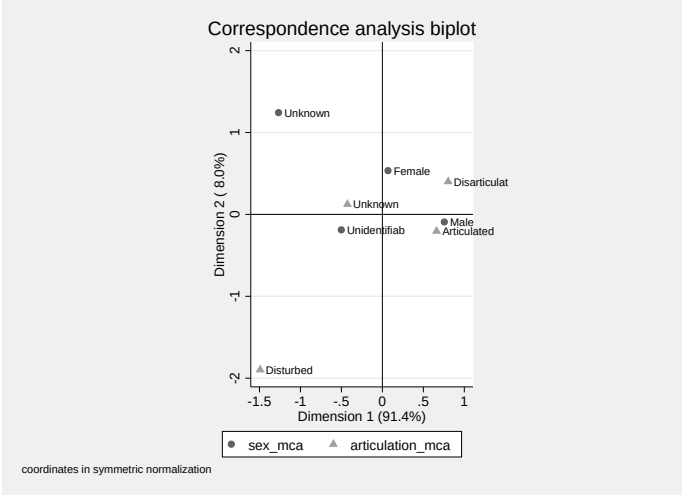

Figure 63. CA scatterplot of sex and articulation within eastern structures at mid-level sites.

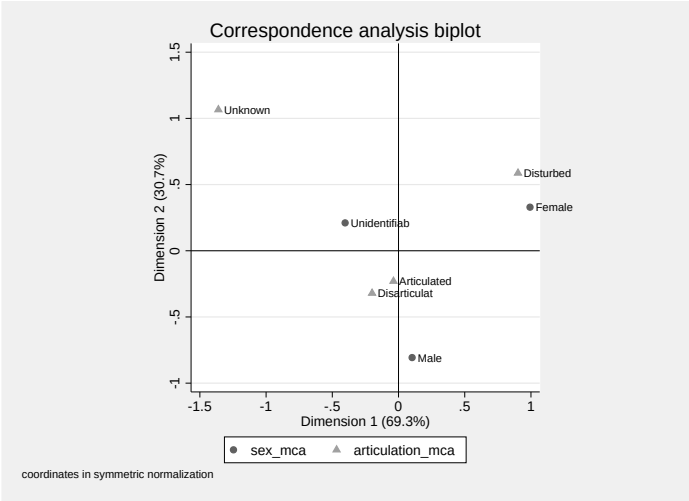

Figure 64. CA scatterplot of sex and articulation at mid-level sites, non-eastern structures.

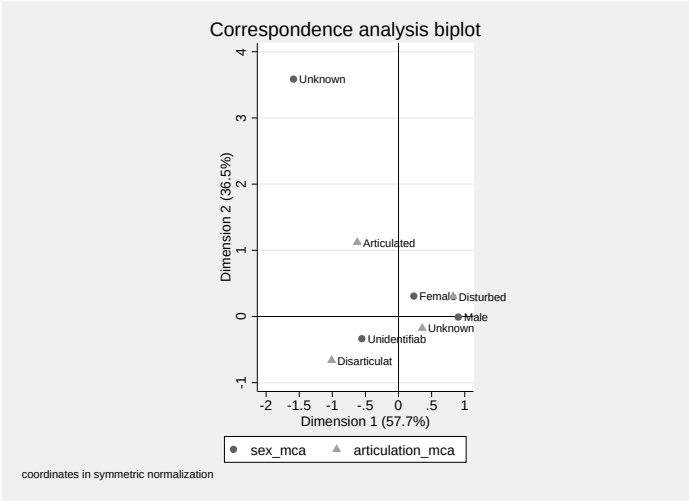

Figure 65. CA scatterplot of sex articulation at upper-level sites, eastern structures.

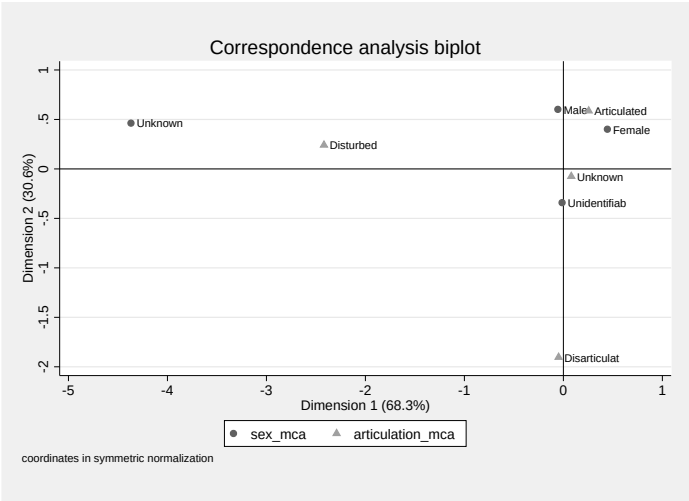

Figure 66. CA scatterplot of sex articulation at upper-level sites, non-eastern structures.

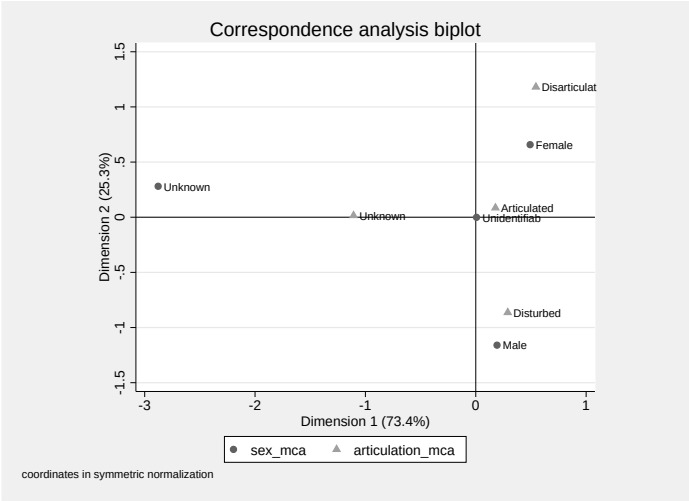

Figure 67. CA scatterplot of sex and articulation at lower-level sites, all structures.

Within eastern structures at mid-level sites, males group closely with primary burials while females are farther from this cluster. Association between sex and form of disposal is not statistically significant at the $p < 0.05$ level ($\chi^2 = 2.28$; $df = 3$; $p = 0.516$). Neither is associated with secondary burials (Figure 68). In non-eastern structures (Figure 69) both males and females cluster very loosely with primary burials, which is not statistically significant at the $p < 0.05$ level ($\chi^2 = 1.19$; $df=1$; $p = 0.274$).

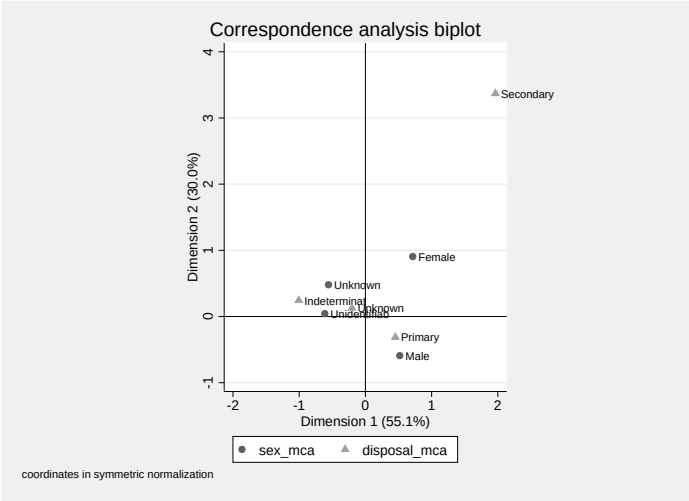

Figure 68. CA scatterplot of disposal and sex at mid-level sites, eastern structures.

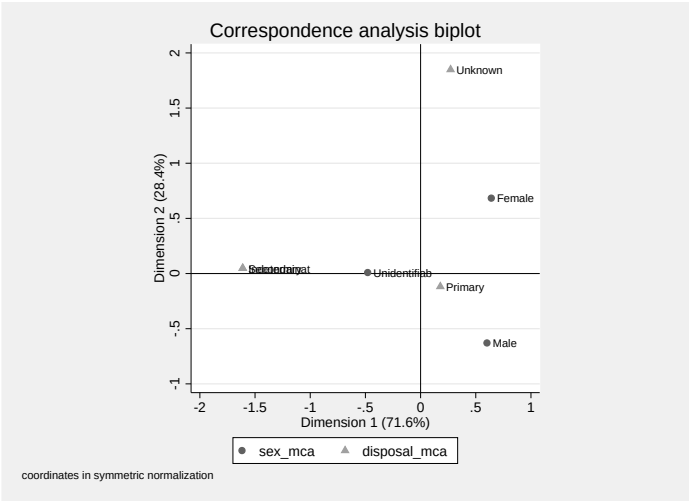

Figure 69. CA scatterplot of disposal and sex at mid-level sites, non-eastern structures.

In comparison to mid-level sites, interments within eastern structures of upper-level sites show patterning that is difficult to interpret (Figure 70). Females are loosely clustered with primary but males are approximately equidistant between primary and secondary and cluster with burials of unknown disposal type. Upper-level, non-eastern sites show that males and females are loosely clustered with primary. Secondary burials

are not associated (Figure 71). There are far more primary than secondary burials so these vague results could be due to sample size (see Appendix D). At lower-level sites, males and females cluster loosely with primary interments and secondary are not proximate.

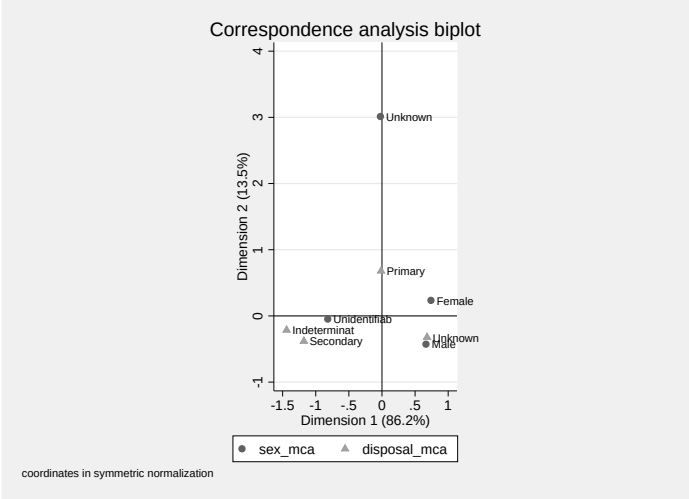

Figure 70. CA scatterplot of disposal and sex at upper-level sites, eastern structures.

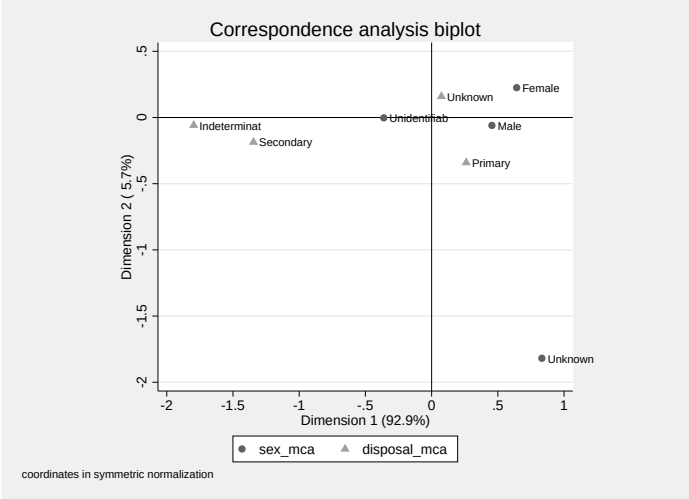

Figure 71. CA scatterplot of disposal and sex at upper-level sites, non-eastern structures.

Within eastern structures at mid-level sites, there is only loose patterning of sex with respect to individuality, the number of individuals in a single grave context (Figure 72). Data was not sufficient to do a CA on individuality and sex for burials not interred in eastern structures. In upper-level eastern structures, males and females are clustered with both multiple and single types of interments, although males are slightly closer (Figure 73). In non-eastern structures at upper-level sites, females are associated with single individual interments and males with multiple interments. There were not sufficient data for a CA analysis of individuality at lower-level sites.

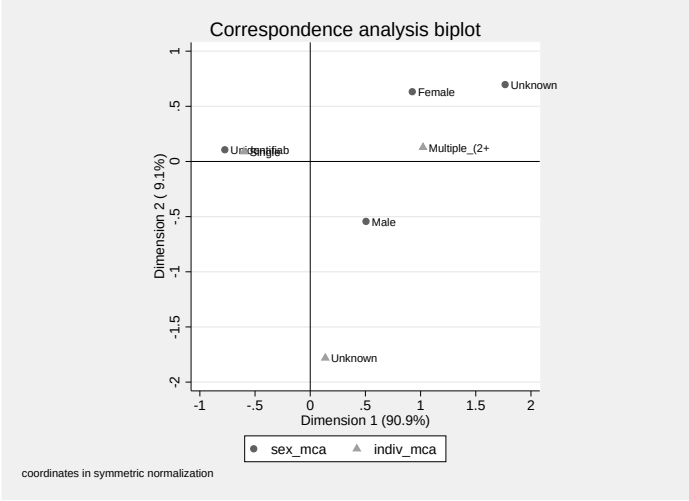

Figure 72. CA scatterplot individuality and sex at mid-level sites, eastern structures.

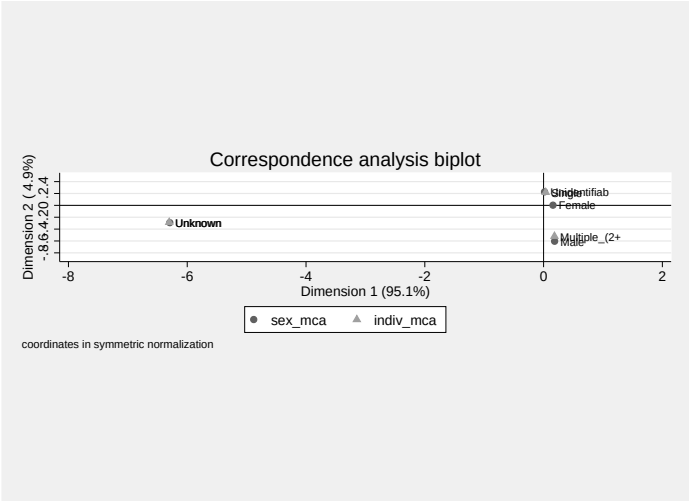

Figure 73. CA scatterplot of individuality and sex at upper-level sites, non-eastern structures.

Within eastern structures at mid-level sites there are not many grave contexts that were left open. Sample sizes are particularly low for females (possibly open = 1, open = 1). There are three cases for which the individual may have been left in open space, one female and two males. These are the multiple individual interrment from the Chan site (CH.5.3.A-E). There is one individual, a female, from an upper-level site, Pacbitun, that may have been left to decompose in open space. No individuals were interred in open space in lower-level sites.

Sex: Burial facility. Differences in burial location are assessed first, in particular whether males or females are more likely to have been interred in eastern structures. The CA scatterplot shows that at mid-level sites males cluster tightly with eastern structures, plaza, and residential locations (Figure 74). However, an association between sex and structure type is not significant a that $p < 0.05$ level ($\chi^2 = 6$; $df = 6$; $p = 0.677$, Fisher's

exact = 0.662). There are more males in eastern structures (n=29), generally, than females (n=12) at mid-level sites when all time periods are considered.

At upper-level sites, females cluster closer to eastern structures while males are closer to western structures with a ritual function. This association is not significant at the $p < 0.05$ level ($\chi^2 = 9.29$; $df = 9$; $p = 0.411$). Interments at upper-level sites were placed most commonly in structure that served a ritual function and also within residences (Figure 75). Generally, there are fewer structure types found at lower-level sites, thus males and females were both commonly recovered from residences (Figure 76).

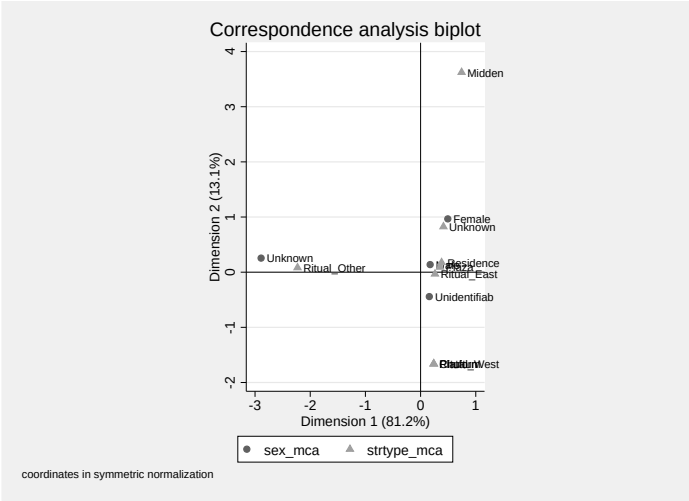

Figure 74. CA scatterplot of structure type and sex at mid-level sites.

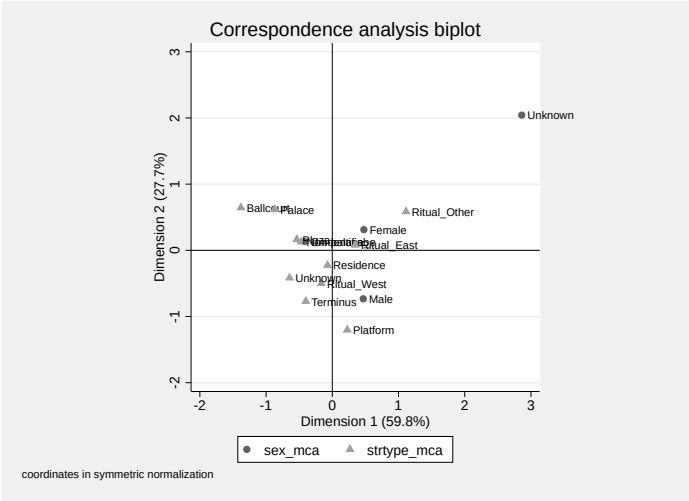

Figure 75. CA scatterplot of structure type and sex at upper-level sites.

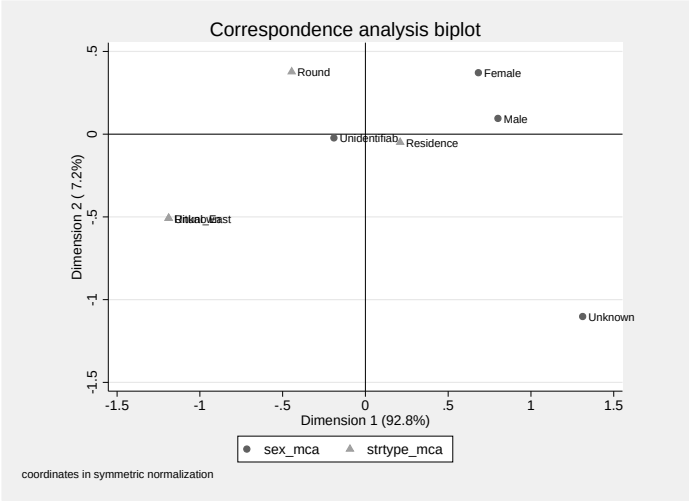

Figure 76. CA scatterplot of structure type and sex at lower-level sites.

Within eastern structures at mid-level sites males and females appear to be more likely to have been interred in crypts or cists (Figure 77). The association between sex and grave type is significant at the $p < 0.05$ level ($\chi^2 = 1.63$; $df = 4$; $p = 0.002$). There is very little patterning in the data from non-eastern structures at mid-level sites (Figure 78). Crypts are very loosely associated with males, which is not statistically significant at the

$p < 0.05$ level ($\chi^2 = 4.55$; $df = 2$; $p = 0.102$; Fischer's exact $p = 0.139$). Consistent with results detailed above, there are more grave types in non-eastern structures.

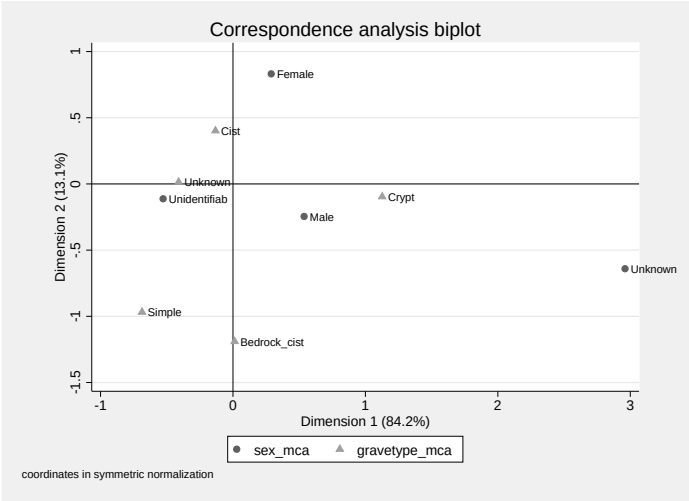

Figure 77. CA scatterplot of grave type and sex within eastern structures at mid-level sites.

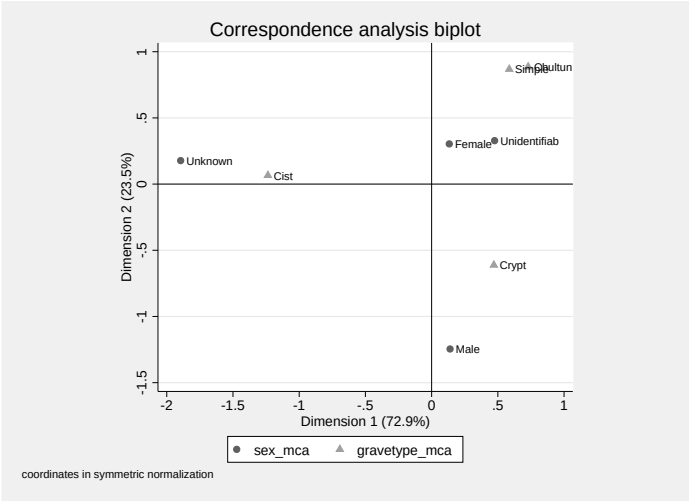

Figure 78. CA scatterplot of grave type and sex at mid-level sites in non-eastern structures.

At upper-level sites, males cluster closer to crypts than do females. Females are loosely grouped with cists. Males also group more closely to tombs (Figure 79). There is no statistically significant association between sex and grave type at the $p < 0.05$ level ($\chi^2 = 2.87$; $df = 4$; $p = 0.578$; Fischer's exact $p = 0.748$). In non-eastern structures the points are more dispersed. Cists and crypts cluster loosely with females (Figure 80). At lower-level sites simple graves are the most common and there does not seem to be strong patterning with regards to sex (Figure 81).

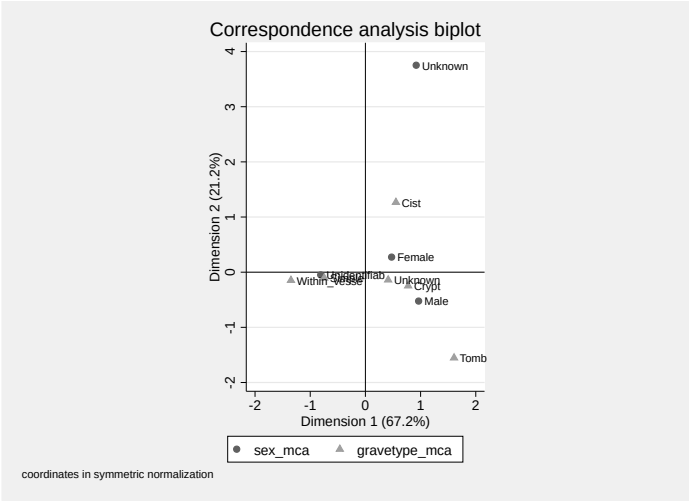

Figure 79. CA scatterplot of grave type and sex for upper-level sites, eastern structures.

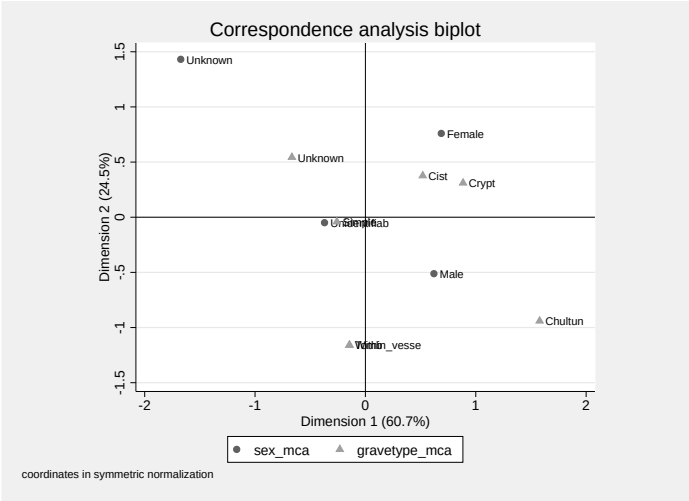

Figure 80. CA scatterplot of grave type and sex for upper-level sites, non-eastern structures.

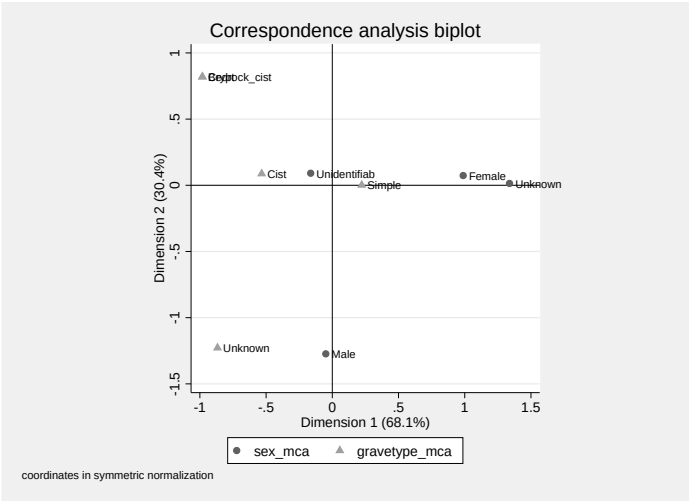

Figure 81. CA scatterplot of grave type and sex for lower-level sites, all structures.

Within eastern structures at mid-level sites females were more likely to be within an intrusive grave and males within a non-intrusive grave (Figure 82). However, this association is not statistically significant at the $p < 0.05$ level ($\chi^2 = 10$; $df = 6$; $p = 0.125$; Fischer's exact $p = 0.098$). The patterning is not clear for interments at mid-level sites that were not within eastern structures (Figure 83).

Both males and females are more strongly associated with non-intrusive graves within the eastern structures of upper-level sites (Figure 84). Patterning with regards to intrusive graves is not clear within non-eastern structures at upper-level sites; the points on the CA scatterplot are very diffuse (Figure 85). Similarly, the plot comparing sex and intrusive graves is very dispersed for lower-level sites (Figure 86). This may be due to lower sample sizes.

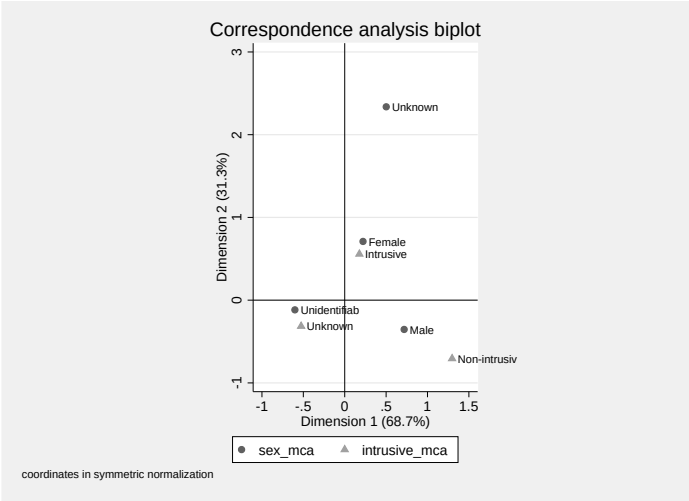

Figure 82. CA scatterplot of intrusive graves and sex at mid-level sites, eastern structures.

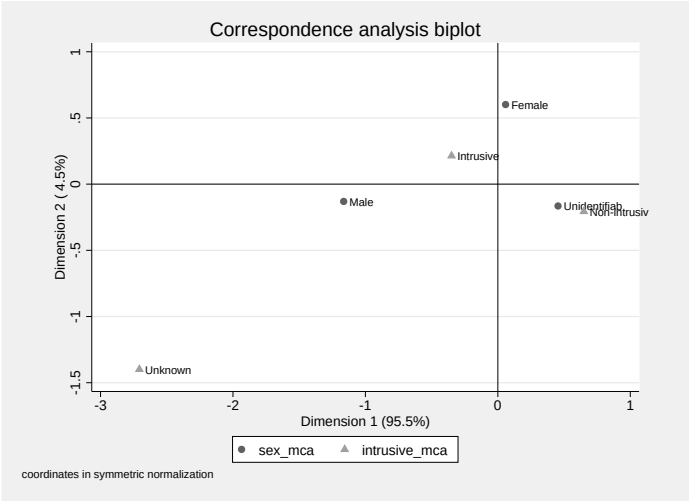

Figure 83. CA scatterplot of sex and intrusive graves at mid-level sites non-eastern structures.

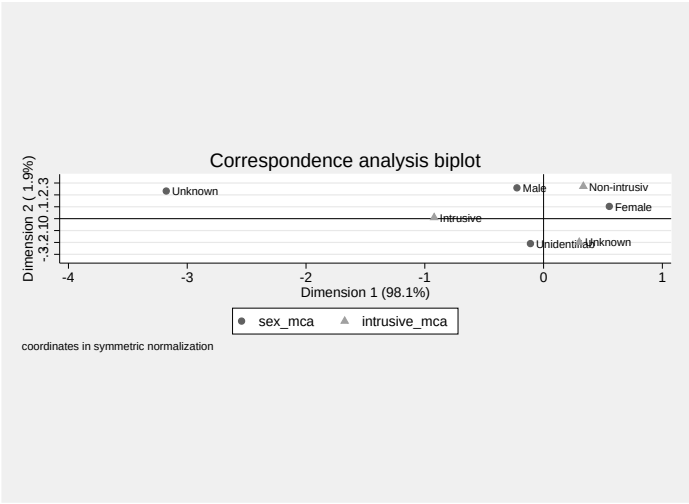

Figure 84. CA scatterplot of intrusiveness and sex at upper-level sites, eastern structures.

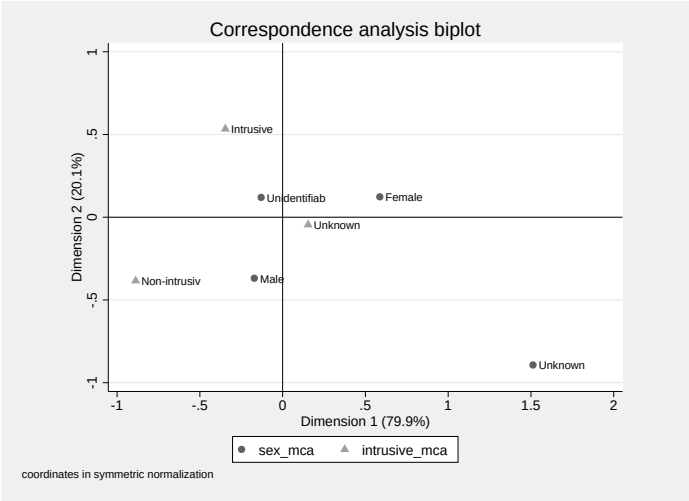

Figure 85. CA scatterplot of intrusive graves and sex at upper-level sites, non-eastern structures.

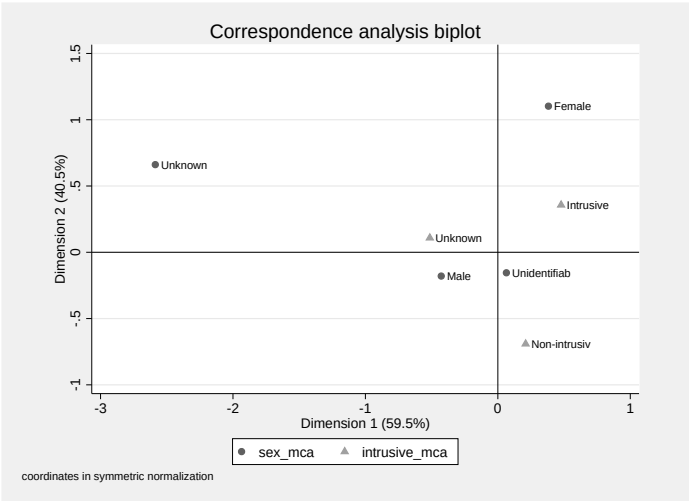

Figure 86. CA scatterplot of intrusive graves and sex for lower-level sites.

In sum, sex does not seem to have been distinguished through burial facilities, except grave type. When assessing structure type, the CA scatterplot shows males grouping closely with eastern structures. There are data for eleven females compared to twenty-one males, so sample size may be in effect here. At upper-level sites females are

closer to eastern structures while males are closer to western and other structures of ritual function. Males and females are not distinguished by burial location at lower-level sites. Grave type analyses with regards to sex are not particularly illustrative, however this was the only association that was statistically significant. At mid-level sites both males and females group loosely on the scatterplot with cists and crypts. Mid-level sites non-eastern sites showed no discernible patterning with respect to grave type and sex. There was slightly clearer grouping of sexes with grave type for upper-level sites – males with crypts and females with cists. The non-eastern structures at upper-level sites showed no discernible patterning, as did lower-level sites.

Females were more likely to be in intrusive deposits than males within eastern structures of mid-level sites. Again, patterns with respect to intrusive graves at non-eastern, mid-level sites are ambiguous. At upper-level eastern structures males and females were clustered with non-intrusive graves and patterning at non-eastern structures was ambiguous. The plot of sex and intrusiveness at lower-level sites was also ambiguous. The following describes body treatment variables with respect to sex.

There is not much distinction according to sex with respect to interment in eastern structures. In eastern structures of mid-level sites, males seem to cluster more with articulated interments and females with disarticulated. In non-eastern contexts at mid-level sites females are loosely related to disturbed interments while males, again, cluster loosely with articulated. At upper-level sites, both sexes grouped with disturbed interments. The opposite is observed for non-eastern structures at upper-level sites – both sexes group more closely with articulated. Again, patterning is less clear at lower-level sites. Males also group closely with primary burials, although females are not far, when

burials from eastern structures at mid-level sites are compared. In non-eastern structures both sexes are associated with primary burials. Patterning with respect to disposal was difficult to interpret from upper-level sites. Within their eastern structures, females clustered loosely with primary and males are pulled equidistant between secondary and primary. At non-eastern structures both sexes are associated with primary interment, as they are at lower-level sites, albeit the grouping is loose. For individuality, there is only very loose patterning according to sex within eastern structures at mid-level sites. This is likely due to sample size. There were not enough data to address individuality outside of eastern structures. At upper-level eastern structures, males and females clustered with both single and multiple types of disposal. Females were more closely grouped with single individual interments in non-eastern structures. There was not sufficient data to address individuality at lower-level sites. In general, there were very few contexts likely left open after placement of the deceased body. There were no reliable patterns with regards to sex and funerary space.

In conclusion, sex does not seem to have exerted a strong influence over differential treatment with respect to burial facilities. There did seem to be more males in the eastern structures of mid-level sites. Sex does not seem to have exerted a strong influence over differential body treatment, either. Results are in line with the broader dataset – there was generally more variability and less patterning outside of eastern structures than within.

*Age: Body treatment***.** Within eastern structures at mid-level sites adolescent individuals are remarkably far from the rest of the data points (Figure 87). In non-eastern structures,

young adults group closely with disarticulation and middle adults with articulated (Figure 88).

Within eastern structures of upper-level sites, Old Adults, Infants and Children are distinct from the rest of the data points (Figure 89). Within non-eastern structures distarticulated interments are distinct from the rest of the data points (Figure 90). Lower-level sites show little patterning (Figure 91).

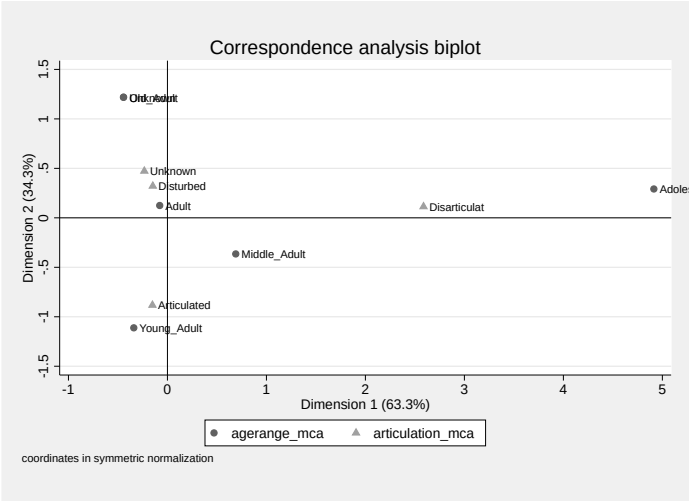

Figure 87. CA scatterplot of articulation and age at mid-level sites, eastern structures.

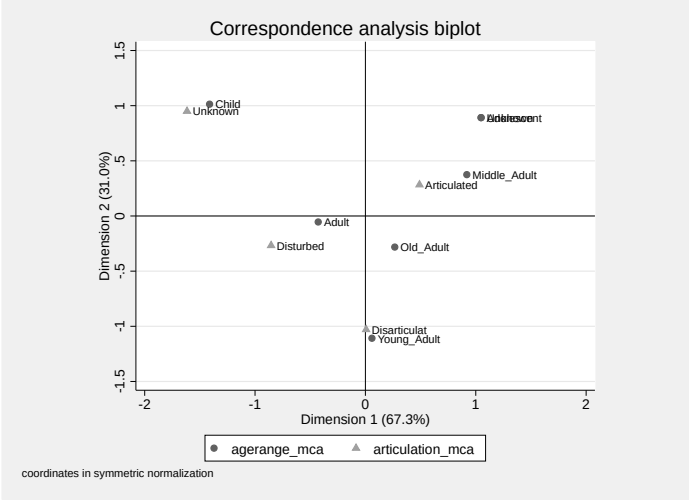

Figure 88. CA scatterplot of articulation and age at mid-level sites, non-eastern structures.

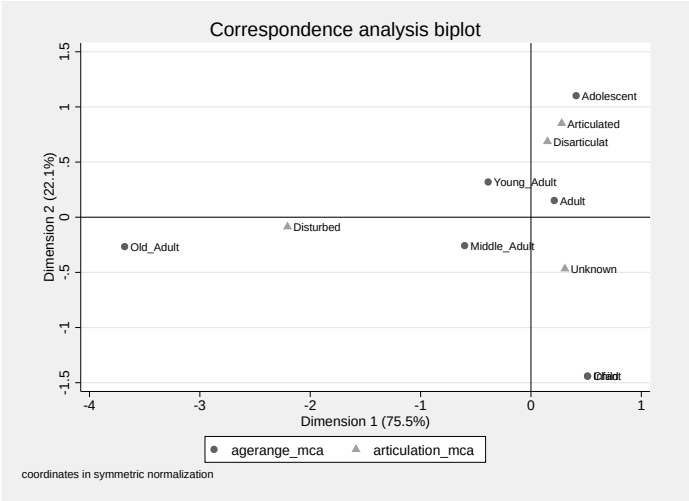

Figure 89. CA scatterplot of articulation and age at upper-level sites, eastern structures.

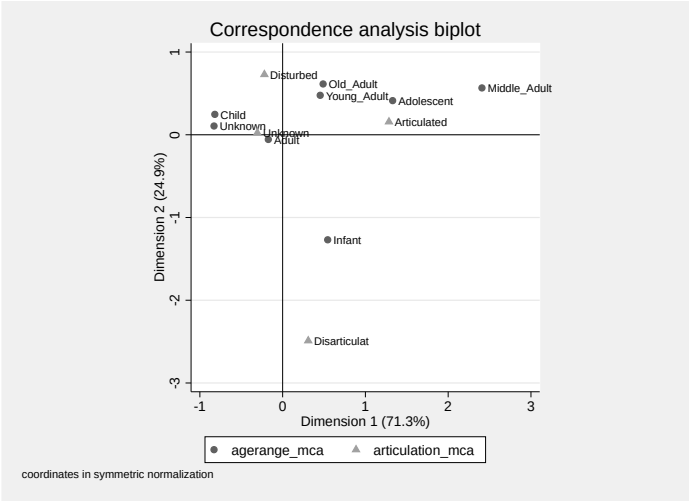

Figure 90. CA scatterplot of articulation and age at upper-level sites, non-eastern structures.

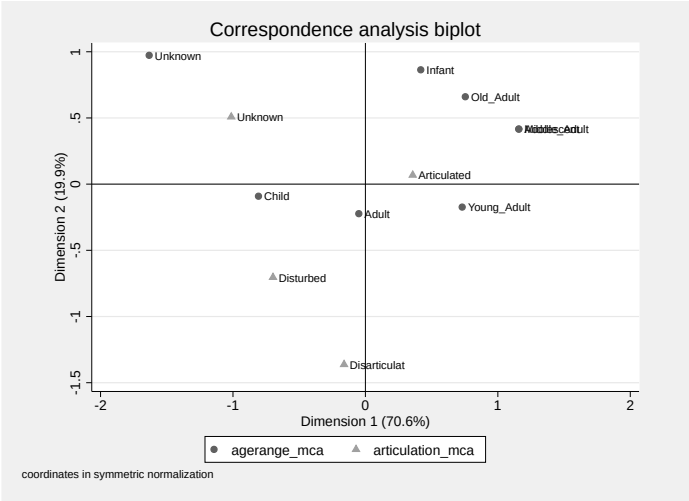

Figure 91. CA scatterplot of articulation and age at lower-level sites.

Within eastern structures of mid-level sites there is no patterning with respect to disposal and age. Young adults and adolescents cluster closely as do Middle Adults and primary styles of interment (Figure 92). No patterning is evident in the plot of burials from non-eastern sites (Figure 93).

Within eastern structures of upper-level sites, children and infants are distinct from the rest of the age ranges (Figure 94). Within non-eastern structures, Middle Adults and Infants are distinct (Figure 95). At lower-level sites, a tight cluster near the origin suggest little variation (Figure 96).

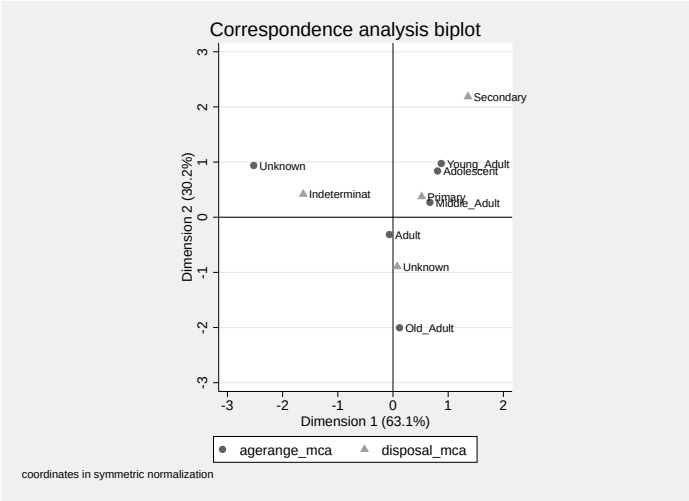

Figure 92. CA scatterplot of disposal and age at mid-level sites, eastern structures.

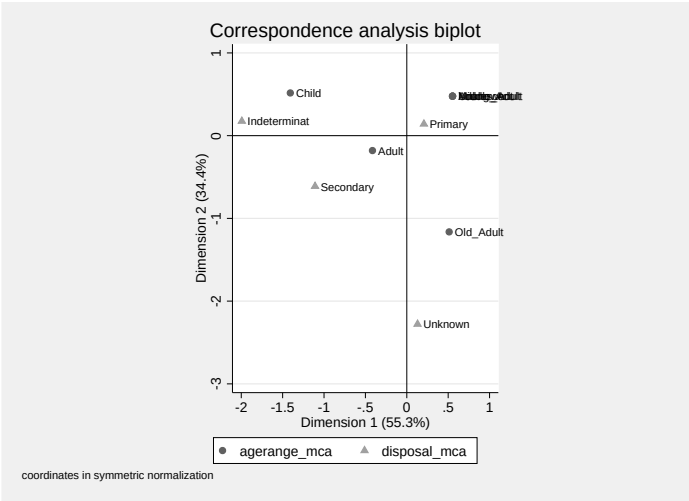

Figure 93. CA scatterplot of disposal and age at mid-level sites, non-eastern structures.

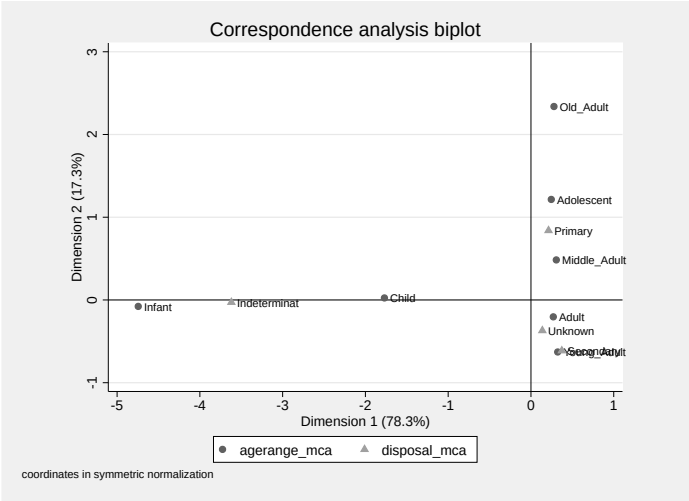

Figure 94. CA scatterplot of disposal and age at upper-level sites, eastern structures.

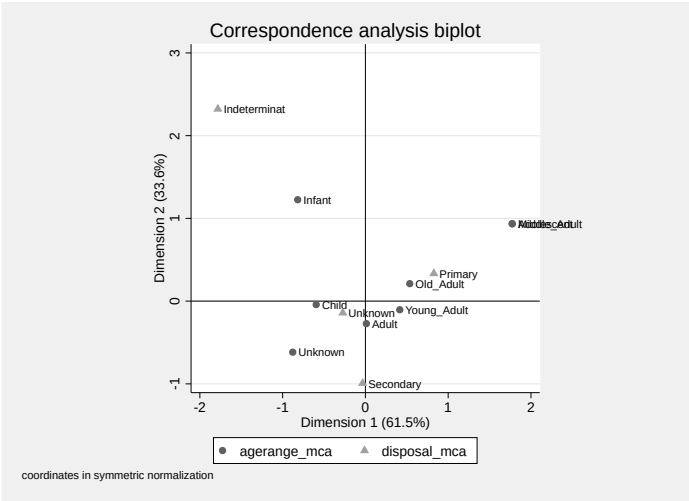

Figure 95. CA scatterplot of disposal and age at upper-level sites, non-eastern structures.

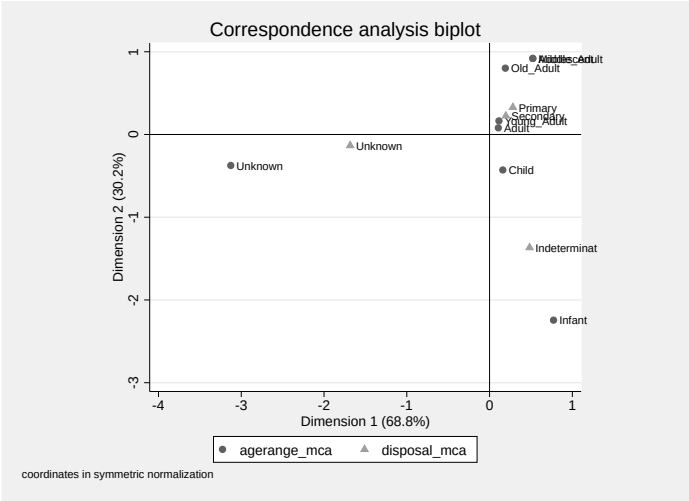

Figure 96. CA scatterplot of disposal and age at lower-level sites.

Within eastern structures at mid-level sites, Young and Middle Adults cluster closely with multiple individual burials. Adolescents and Old Adults are distinct from this main cluster (Figure 97). There were not sufficient data from mid-level sites, non-eastern structures for analysis.

Within upper-level sites, eastern structures infants and children are distinct from the main cluster of points closer to the origin. Young adults and adolescents again cluster closely with multiple individual interments (Figure 98). In non-eastern structures at upper-level sites the relevant data are clustered near the origin and do not appear vary much (Figure 99). There were not enough data to assess lower-level sites. In sum, it does not appear that the ancient Maya of the Belize Valley relied on age as a distinguishing feature for interment in eastern structures at any of the site types analyzed here.

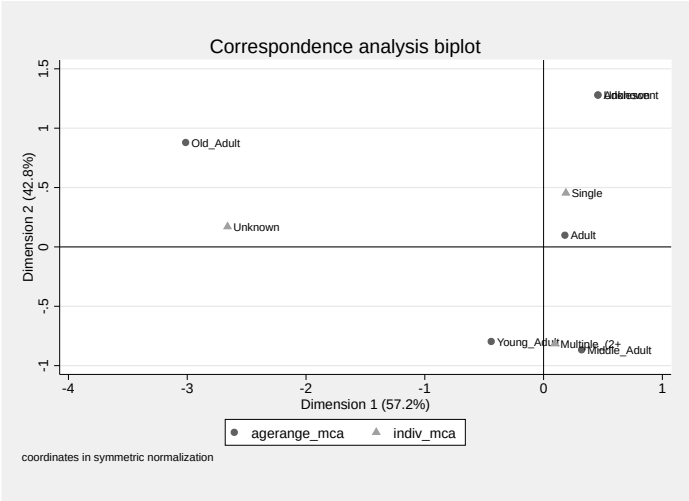

Figure 97. CA scatterplot of Individuality and age at mid-level sites, eastern structures.

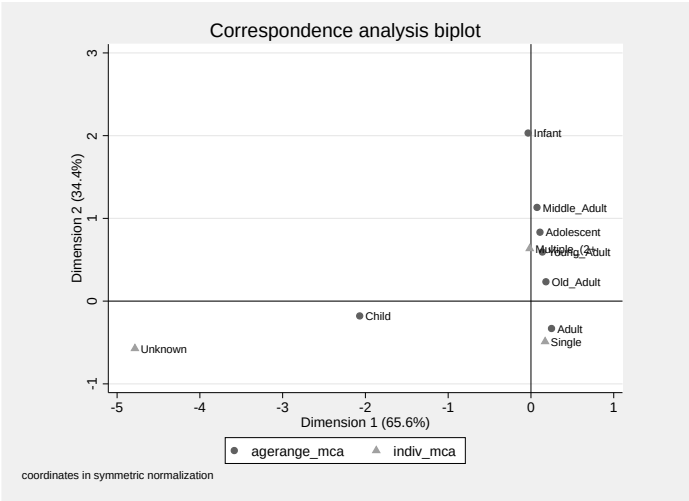

Figure 98. CA scatterplot of individuality and age at upper-level sites, eastern structures.

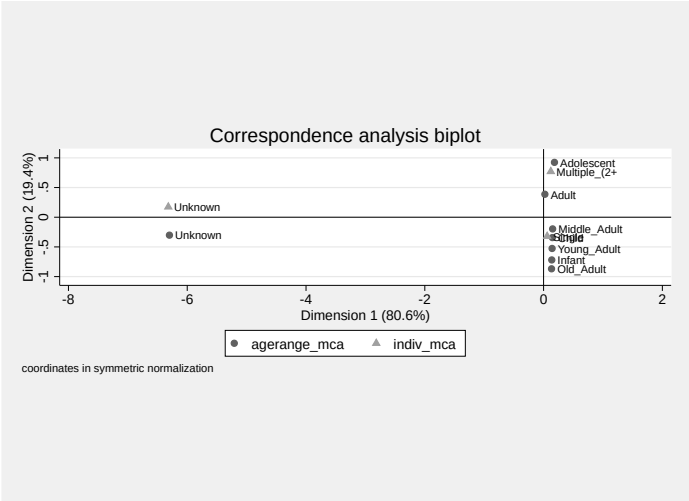

Figure 99. CA scatterplot of individuality and age at upper-level sites, non-eastern structures.

Age: Burial facility. The CA scatterplot of burial location by structure and age at mid-level sites (Figure 100) shows a cluster of ages and burial locations near the origin with juvenile burials distinct from the other age groups. The opposite is the case at upper-level sites where children are closer to both Old and Young adults (Figure 101). At lower-level sites children are cluster with other age groups and infants are distinct (Figure 102).

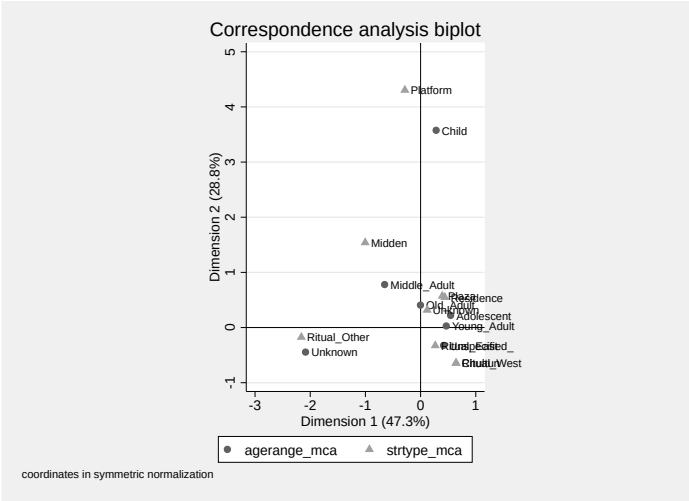

Figure 100. CA scatterplot of structure type and age range at mid-level sites.

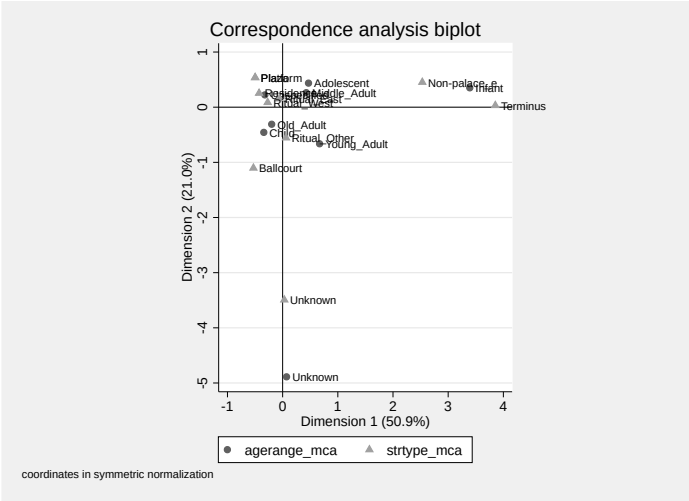

Figure 101. CA scatterplot of structure type and age range at upper-level sites.

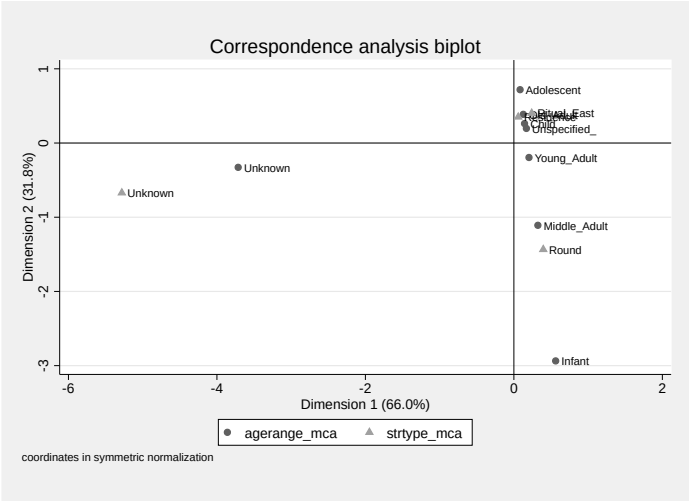

Figure 102. CA scatterplot of structure type and age range at lower-level sites.

Adolescents are distinct from the other age groups in the CA scatterplot comparing grave type and age within eastern structures at mid-level sites (Figure 103). Old adults and children are also distinct. At non-eastern structures within mid-level sites there is little patterning (Figure 104). Within eastern structures at upper-level sites infants and adolescents are distinct, as are young adults (Figure 105). Patterns according to age and grave type are less obvious within the upper-level, non-eastern structures (Figure 106). For lower-level sites, all structures, adults and Middle adults are distinct from the cluster at the type right hand corner (Figure 107).

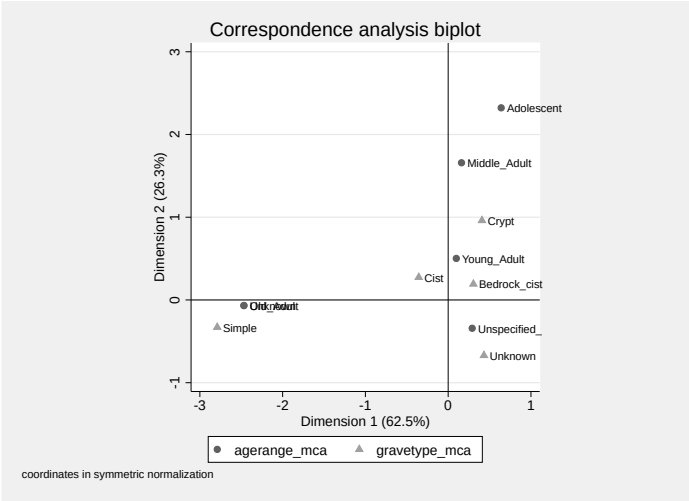

Figure 103. CA scatterplot of grave type and age at mid-level sites, eastern structures.

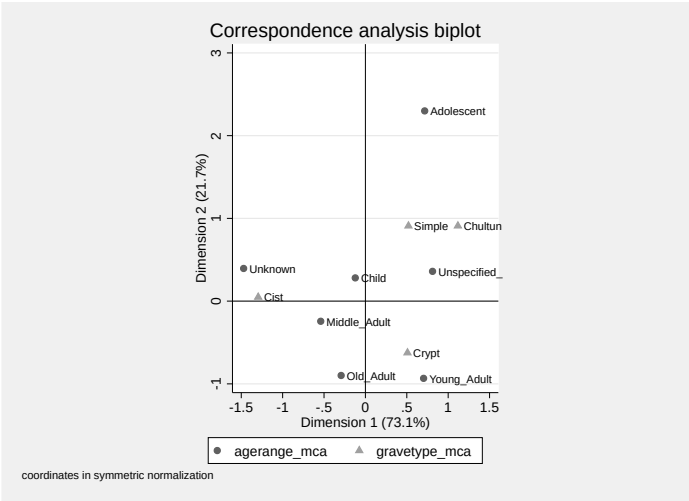

Figure 104. CA scatterplot of grave type and age range at mid-level sites, non-eastern structures.

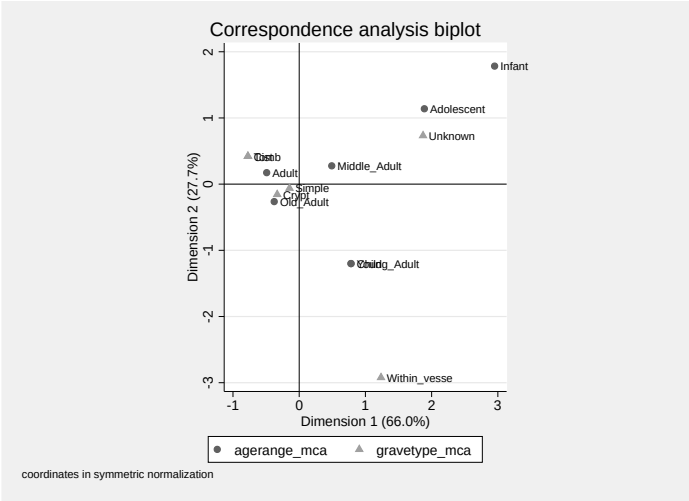

Figure 105. CA scatterplot of grave type and age at upper-level sites, eastern structures.

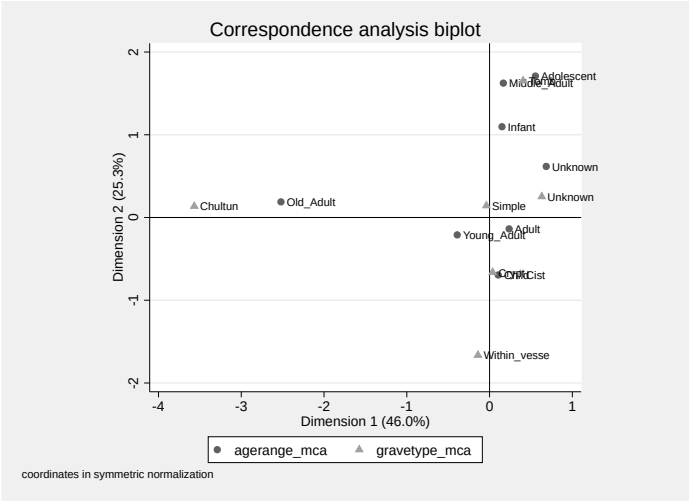

Figure 106. CA scatterplot of grave type and age at upper-level sites, non-eastern structures.

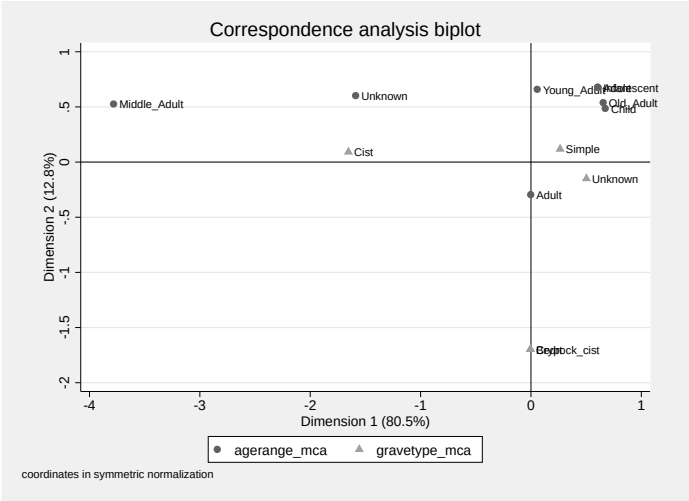

Figure 107. CA scatterplot of grave type and age at lower-level sites.

Within eastern structures at mid-level sites, there is not much patterning with respect to age and intrusive interments (Figure 108). At non-eastern structures adolescents and children are more closely clustered with non-intrusive interments and young and unspecified adults are closer to intrusive interments (Figure 109). There is no apparent patterning with respect to age and intrusive interments at upper-level sites within eastern structures or non-eastern structures (Figure 110, 111). Similar lack of patterning is seen at lower-level sites when all structures are considered (Figure 112).

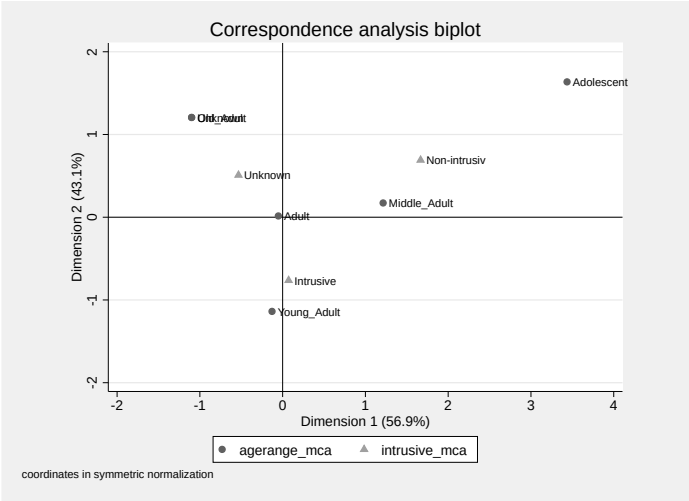

Figure 108. CA scatterplot of intrusiveness and age at mid-level sites, eastern structures.

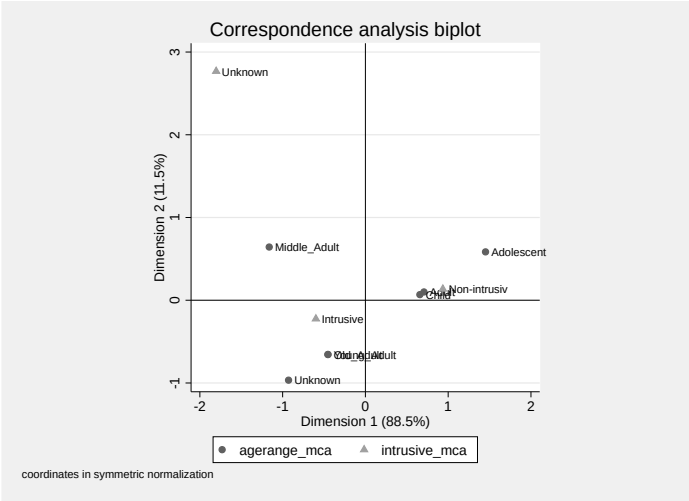

Figure 109. CA scatterplot of intrusiveness and age at mid-level sites, non-eastern sites.

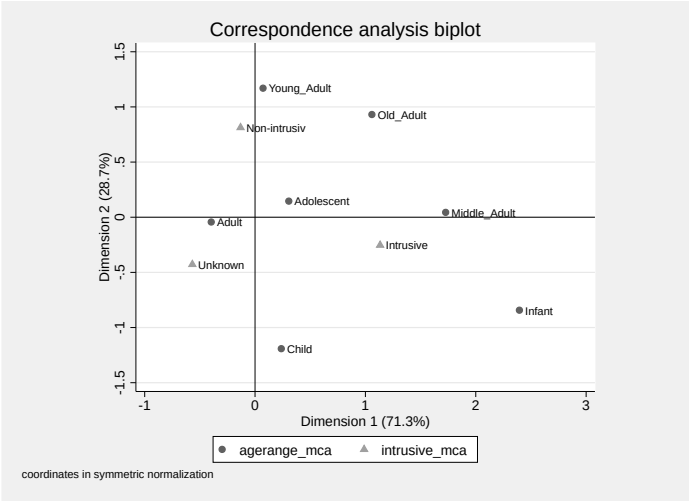

Figure 110. CA scatterplot of intrusive interments and age at upper-level, eastern structures.

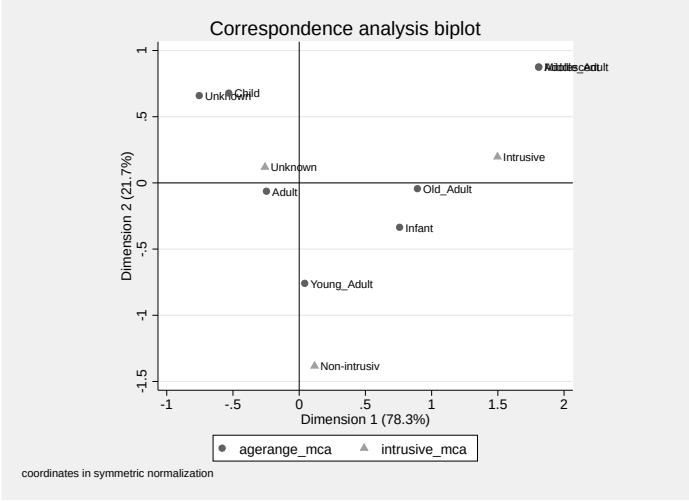

Figure 111. CA scatterplot of intrusive interments and age at upper-level sites, non-eastern structures.

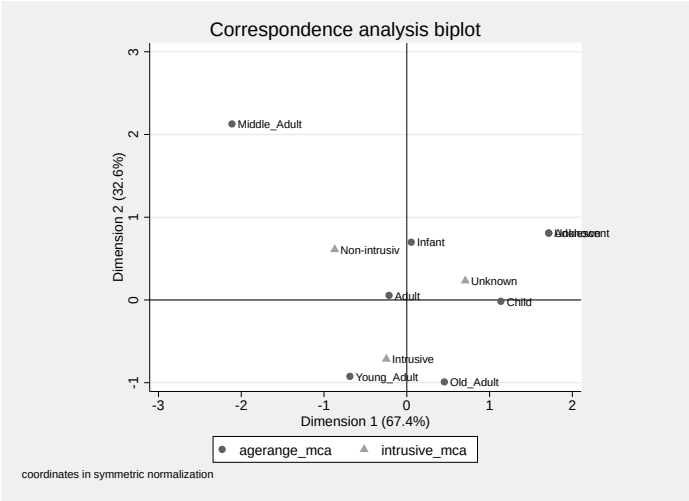

Figure 112. CA scatterplot of intrusiveness and age at lower-level sites.

In sum, there does not seem to be clear patterning with respect to different ages and burial facilities. At mid-level sites juveniles and adolescents were consistently distinct. It is interesting that there were people of younger ages within eastern structures, contrary to Expectation 3.

Table 5 in Appendix D presents a summary of mortuary patterns by site type. To summarize the results of the mortuary analysis, mid-level sites follow the general Belize Valley patterns with respect to head orientation (south), body deposition (prone), and body position (extended). The eastern structures in particular showed more consistency through time in these traits, while non-eastern structures showed more variability. Body disposal (primary or secondary) was consistently primary and there were not many secondary burials in eastern or non-eastern structures. When they did occur, they were most commonly placed within graves containing multiple primary individuals. Cists and crypts were typically used to inter people in mid-level sites eastern structures, and they

were also common in non-eastern structures. Through time, interments were commonly intrusive into existing architecture in eastern structures. Burials in all locations and across time were predominantly articulated, including in eastern structures. Funerary space within the grave was consistently filled. Finally, single individual burials predominate over time, but multiple individual interments became more common in the Late Classic period. Age and sex did not appear to contribute significantly to variation in mortuary treatment in the Late Classic period. Individuals of young age were interred in eastern structures, which is contrary to the stated expectation that elderly individuals would be predominant in these contexts. Both males and females are found in eastern structures in the Late Classic period. In sites of all three types, multiple individual burials were the setting of re-entry episodes that occurred over the course of a century or more.

These data were collected to shed light on interactions of the living with the skeletal remains of individuals interred in ancestral contexts. Within eastern structures, traits common throughout the Belize Valley are adhered to even more consistently than seen in non-eastern structures. I expected interaction to be particularly visible in the degree of articulation, frequency of secondary burials, and open funerary space. In fact, these variables showed little variation. Interaction between skeletal remains by the living seems to be focused on the multiple individual burials in eastern, and other ritual, structures. There were differences between the upper-level and lower-level sites. These patterns will be explored in the discussion.

Expectation 3: Biodistance

Biodistance data were analyzed to address whether individuals interred in eastern structures at mid-level sites were members of biological lineages. The expectation is that these eastern structures were maintained by biological lineages that emphasized their leadership and power by interring family members within one structure. Interment therein suggests the individual earned the status of ancestor, as the east is associated with ancestors in Maya mythology (see Chapter 2). The aim was to compare burials from each eastern structure to burials from other burial locations to assess whether those within the eastern structures were more likely to have been biologically related to each other than to those interred elsewhere. Descriptive statistics of all dental metric data are given in Appendix C. The sample size was reduced due to missing data and so only comparisons could be made at the inter-site level.

The final dataset used for the analyses consisted of six cervico-metric values – ULI1MD, ULCMD, ULM1MD, ULCBL, LLCBL, and LLP1BL – from 12 sites. All burials date to the Late Classic period. Several sites with small samples that were geographically proximate were combined to retain as much data as possible. Sites included in the analyses are Actuncan, Baking Pot, Barton Ramie, Chaa Creek, Chan, Chan NE, San José, Cahal Pech, Xunantunich, Zubin.

ANOVA was used to assess the extent to which there were significant differences between site means. Two measurements show statistically significant differences between means at the $p < 0.05$ level – ULI1MD ($p = 0.0014$) and LLP1BL ($p = 0.031$). One of the assumptions of ANOVA is that the variance of each variable will be equal if the samples

are from the same population. Homogeneity of variances was assessed using Levene's test (*W*) (see Table 25). None of the variables were significant at the $p < 0.05$ level indicating no significant difference between the variances of the sites sampled.

Table 17. ANOVA results of differences in variable means between sites.

	W(*p*)	**F(*p*)**
ULI1MD	1.56(0.133)	**3.44(0.0014)**
ULCMD	1.39(0.207)	1.37(0.219)
ULMIMD	0.897(0.549)	1.37(0.216)
ULCBL	1.23(0.290)	1.54(0.147)
LLCBL	1.23(0.290)	0.44(0.929)
LLP1BL	1.28(0.260)	**2.18(0.031)**

MANOVA was used to assess whether any of the between-site means were significantly different when all variables were taken into account. Following Scherer (2004:207) used Wilk's lambda to assess significance. Wilk's lambda functions similar to the *F*-test in an ANOVA and measures the proportion of variance that is unaccounted for by the independent variable (here, each site). If there is a large amount of variance attributable to the independent variable then there are likely significant differences in the mean values. Wilk's lambda was not significant at the $p < 0.05$ level ($\lambda = 0.184$; $df = 11$; $p = 0.066$). Generally, there is not very much variation between the sites in this sample.

Statistically significant differences between several measurements suggests that multivariate analyses may yield patterns in the data not visible in univariate analyses. Principal Components Analysis, a data reduction technique that enables

exploration of complex multivariate data, was conducted to reveal structure and patterns that are not immediately obvious (Baxter 1994:48). The first three components explain 77.08% of the variation (Figure 113, Table 18). The component loadings are not easily interpretable with regards to variation in dental anatomy, including tooth class or position in the dental arcade.

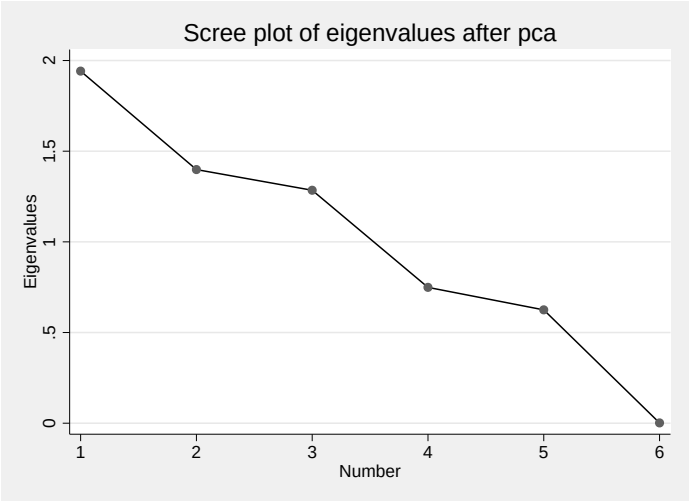

Figure 113. Eigenvalues of metric data PCA

Table 18. Extracted components and Eigenvalues from PCA

Variable	Comp1	Comp2	Comp3
ULI1MD	-0.423	-0.588	0.051
ULCMD	0.012	0.131	-0.831
ULM1MD	-0.481	0.421	0.282
ULCBL	0.592	-0.080	-0.098
LLCBL	0.402	-0.378	0.373
LLP1BL	0.274	0.556	0.276
Eigenvalue	1.941	1.398	1.284
Proportion	32.36%	23.31%	21.41%

The scatterplot of PC1 and PC2 shows only very loose patterning by site (Figure 114). An interesting point is that the only non-Belize Valley site, San José, is not distinct from the Belize Valley sites. San José (site code SJ) appears to cluster with Barton Ramie (site code BR), in general. Barton Ramie forms a loose cluster to the left, indicated by circle 1. A tighter cluster, indicated by circle 2, consisting of burials from the general region of Cahal Pech form a second cluster.

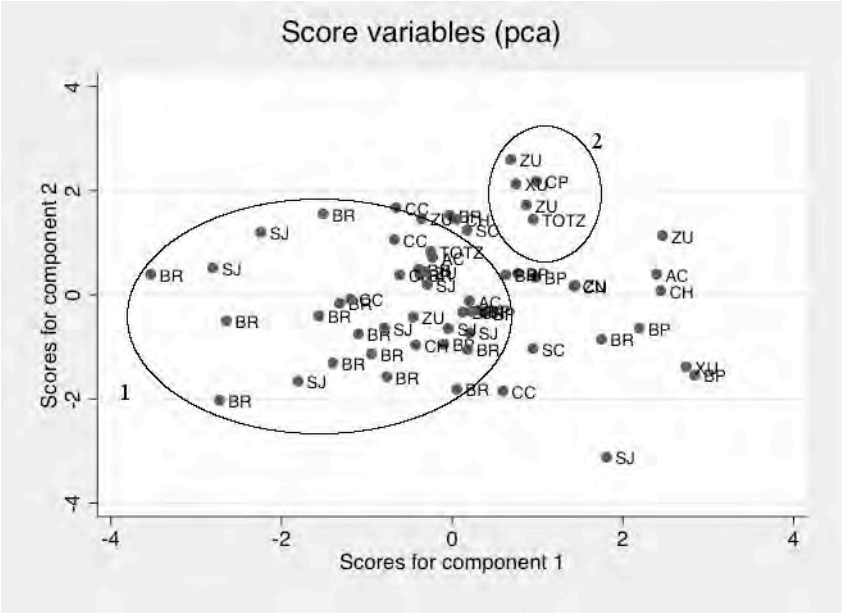

Figure 114. Scatterplot of PC1 and PC2 scores. Labels indicate the site.

I calculated the Mahalanobis distances between sites. For this analysis several of the sites were collapsed into one – Tzotz, Tolok, and one burial from the Cahal Pech site center. The site of Saturday Creek was dropped because it only had two individuals. The final data set consisted of ten sites. The results are given in Table 27. Following Scherer (2004:211), I use the Defrise-Gussenhoven (1967) cutoff 4.123 to indicate significance. Several sites show very slight differences – Actuncan, Baking Pot, Barton Ramie, Chaa Creek, and Zubin show significant differences. Again, the only non-Belize

Valley site, San José, does not depart from the Belize Valley sites. Figure 114 shows the Mahalanobis results plotted using Multidimensional Scaling to provide a visualization of the results. San José does appear to be distinct in this representation of the data, as do Chan and Chan NE. Xunantunich and Cahal Pech overlap and the rest of the sites, Baking Pot, Actuncan, Barton Ramie, Chaa Creek, and Zubin form a tight cluster.

Table 19. Mahalanobis distances for all sites.

	Actuncan	**Baking Pot**	**Barton Ramie**	**Chaa Creek**	**Chan**	**Chan NE**	**San José**	**Cahal Pech**	**Xunantunich**	**Zubin**
Actuncan	0.000									
Baking Pot	**4.243**	0.000								
Barton Ramie	**4.243**	**4.243**	0.000							
Chaa Creek	**4.243**	**4.243**	**4.243**	0.000						
Chan	4.054	4.054	4.054	4.054	0.000					
Chan NE	3.648	3.648	3.648	3.648	3.956	0.000				
San José	3.310	3.310	3.310	3.310	1.978	1.978	0.000			
Cahal Pech	3.339	3.339	3.339	3.339	2.967	0.989	0.989	0.000		
Xunantunich	3.339	3.339	3.339	3.339	2.967	0.989	0.989	0.000	0.000	
Zubin	**4.243**	**4.243**	**4.243**	**4.243**	4.054	3.648	3.310	3.339	3.339	0.000

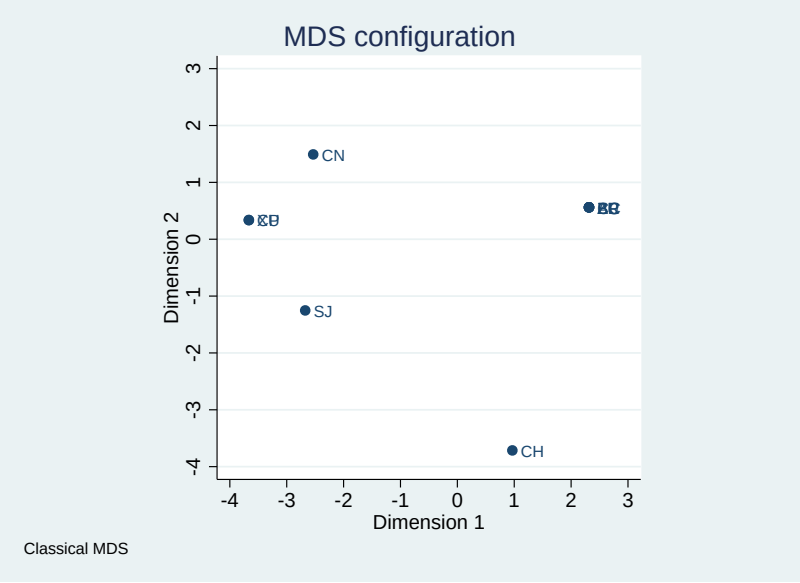

Figure 115. Mulitdimensional scaling plot of Mahalanobis distances

In sum, the hypotheses guiding these analyses was that individuals interred within eastern structures were members of biological lineages. Interment of family members within structures associated with ancestors suggests a lineages shrine. The aim of the biodistance analyses was to indicate whether or not individuals interred within the eastern structures were more closely related to individuals interred in other locations. Unfortunately, the requirements of a complete data matrix for multivariate analyses reduced the sample size significantly and different burial locations could not be compared. However, the remaining data allowed assessment of dental metric variation between sites in the Belize Valley. A regional analysis of this type has not been done previously.

Both univariate and multivariate results presented here indicate that there was generally homogeneity in dental metric variation between sites in the Belize River Valley. One out-group was included in the analysis, San José, which was only distinguishable from the Belize Valley sites in the Multidimensional Scaling plot. The Mahalanobis distances show barely significant distances between the site of Actuncan with Baking Pot, Barton Ramie, Chaa Creek, and Zubin. There were also significant differences between Baking Pot, Barton Ramie, and Chaa Creek. Reasons for these results will be addressed in the next chapter.

Expectation 4: Social Transformation

Results of the radiocarbon dating are given in Table 20. There were insufficient amounts of collagen from ZU.A1.3.D to obtain a reliable date. The interment facilities at Chan NE, a lower-level residential group, were each re-entered over periods extending up

to several centuries. This indicates considerable duration of memory concerning grave location. Even if the graves were simply being re-used for practical purposes, they graves were remembered as part of the active landscape of the residents.

Table 20. Radiocarbon dates from multiple individual burials.

Laboratory number	Specimen number	Material	^{14}C years BP	δ^{14}C age	Calibrated (OxCal online)	Range
X27028	CN.NE3.1.A	Tooth	1,391	38	634 +/-21	613-655
X27029	CN.NE3.1.B	Tooth	1,334	47	700 +/- 46	654-746
X27030	CN.NE1.3.A	Tooth	1,315	47	709 +/-45	664-754
X27031	CN.NE1.3.B	Tooth	1,536	48	525 +/- 59	466-584
X27032	CN.NE3.5.A	Tooth	1,294	45	719 +/-44	675-763
X27033	CN.NE3.5.B	Tooth	1,217	45	793 +/-68	725-861
X27034	CH.NE3.5.C	Tooth	1,277	45	734+/-50	684-784
X27035	CP.B1.7.A	Tooth	1,432	46	607 +/-31	576-638
X27036	CP.B1.7.B	Tooth	1,516	39	525+/-59	466-584
X27037	CP.B1.7.C	Tooth	1,748	47	289 +/-59	230-348
X27038	ZU.A1.3.A	Tooth	1,336	46	699+/-46	653-745
Beta-278917	CH.5.3.B	Tooth	1,230	NA	780 +/- 40	740-820
Beta-278918	CH.5.3.D	Tooth	1,350	NA	660 +/- 40	620-700
X27039	ZU.A1.3.D	Tooth	no data	no data	no data	no data

Burial 3 from Chan, a mid-level site, was also used over the course of at least a century. Three other individuals were placed with this grave, as well. The grave was in the eastern structure in the site center. Other interments were made during this time period, suggesting that the re-use of graves was not simply expedient.

At Cahal Pech, the first occupant of the Burial 7 was placed there as much as 150 years before the second individual was interred in the same grave. The third individual was interred as soon as eight years later. The grave is within a large pyramid on the eastern side of the largest plaza in the site core, structure B1, a large and obvious

landmark. These graves were clearly marked and probably easy to find. Again, many other interments have been recovered from structure B1. While not all would necessarily have been accessible at the time that these individuals were buried, this suggests that the placing of these individuals together was purposeful.

Conclusion

Regional mortuary analyses provide a broad assessment of variation in mortuary treatment according to social organization, site location, and time. Each data set presented here aptly demonstrates that variation is the norm when ancient Maya sites are compared. The radiogenic strontium isotope analyses revealed that some mid-level sites chose non-local individuals for interment in eastern structures more often than others. Leadership, thus, may have been conceptualized differently with the sample of mid-level sites.

The mortuary analyses showed that there are some very consistent mortuary practices in the Belize Valley, but variation always exists. Several key points come to the fore. First, eastern structures were important mortuary locales, but there were a number of other locales that contained human remains and showed evidence of re-visitation to certain graves by the living. Second, multiple individual burials seem to be a consistent focus of re-visitation, particularly in the Late/Terminal Classic period. Third, while there was evidence for disturbance and disarticulation of burials there were not many secondary burials recovered.

The biodistance data can only be interpreted with caution, as sample sizes were small and the dental measurements generally homogenous. However, they hint at the

possibility that multiple individual interments consisted of non-related individuals. These points, as well as challenges to the data collection and analyses, will be discussed further in the following chapter.

CHAPTER 10

DISCUSSION

The overarching research question of this dissertation is how ideology, materializaed through treatment of the deceased body, was a potential source of power among commoners in ancient Maya society. I ask whether non-elite leaders in the Belize River Valley targed certain human bodies, locally born, elderly, male, lineage members, for ancestral veneration through tomb re-entry and ritual interaction with skeletal remains. To review, I use three lines of bioarchaeological evidence to examine how a person's characteristics during life influenced their treatment after death. Firstly, the extent to which those inferred to have been ancestors, based on their interment in eastern structures, were elderly males born and raised locally is tested using biogeochemical analyses of radiogenic strontium isotopes. Secondly, I use mortuary analyses, including taphonomic data, to address whether the living were more likely to have entered into relationships with those interred in eastern structures through prolonged interaction with their skeletal remains. Thirdly, biodistance analyses are used to assess whether those interred in eastern structures were more closely related to each other than to those interred elsewhere, implying that these structures were maintained by one lineage.

In the following I discuss the results presented in Chapter 8, and these results are considered in light of the other sets of analyses. For instance, I present the results of the biogeochemistry analysis and discuss them in the context of burial location, site type, and other mortuary data. This chapter then concludes with a contextualization of these data within the framework of theories of practice.

Expectation 1: Commoner Mobility

Biogeochemical analyses of radiogenic strontium isotope values address Expectation 1, that those interred in eastern structures, interpreted as ancestral locales, would have geographic origins and residential histories consistent with residence in the Belize Valley, or very nearby, based on models of leadership in ancient and modern Maya communities (Wilk 1991; Harriss 1984; Price et al. 2010; Wright 2005). The data contributed from the Chan site and Cahal Pech support this expectation. All the individuals from the eastern structure at Chan show $^{87}Sr/^{86}Sr$ values in both bone and enamel, from which I infer that dietary strontium was likely from the Belize Valley strontium zone. At Cahal Pech, an upper-level site, the individuals within Burial 7 both show $^{87}Sr/^{86}Sr$ values consistent with geographic origins in the Belize Valley. Elemental concentrations suggest possible residence later in life closer to the Central Petén. This result is preliminary, however. Burial 7 included numerous artifacts clearly showing connections outside the Belize Valley, discussed below.

Freiwald's (2011:239) interpretation of data from residential shrines (eastern structures) specifies that all residential shrines contained at least one individual with non-local origins. Figure 1 shows the radiogenic strontium isotope values from eastern structures in Freiwald's Belize River Valley sample with the addition of Chan and the individuals from Cahal Pech analyzed for this dissertation. Mid-level sites are distinguished from upper-level and lower-level sites by an asterix. Several individuals show high and low radiogenic strontium isotope value outliers. Floral Park, Zubin, and Chaa Creek all show one individual with a radiogenic strontium isotope value much

higher than expected for the Belize Valley strontium zone and very distinct from the rest of the radiogenic strontium isotope values at their site. These three individuals have values consistent with the Macal River region, located just south of the Belize Valley, although they are also consistent with radiogenic strontium isotope values from the Belize Valley zone and the Western Lowlands (Freiwald 2011:93). The individual at Zubin was in Burial 3, the multiple individual interment in the eastern structure (Freiwald 2011:184). The individual from Pook's Hill departs from an otherwise very consistent range of radiogenic strontium isotope values for the individuals in the same structure. They were the last interment, however, and could postdate occupation at the site (Freiwald 2011:224). The Chaa Creek individual was interred earlier than the others, dating to the Terminal Preclassic (Connell 2000). His interment disturbed the remains of another skeleton, with a radiogenic strontium isotope value consistent with the Belize River Valley (Freiwald 2011:157).

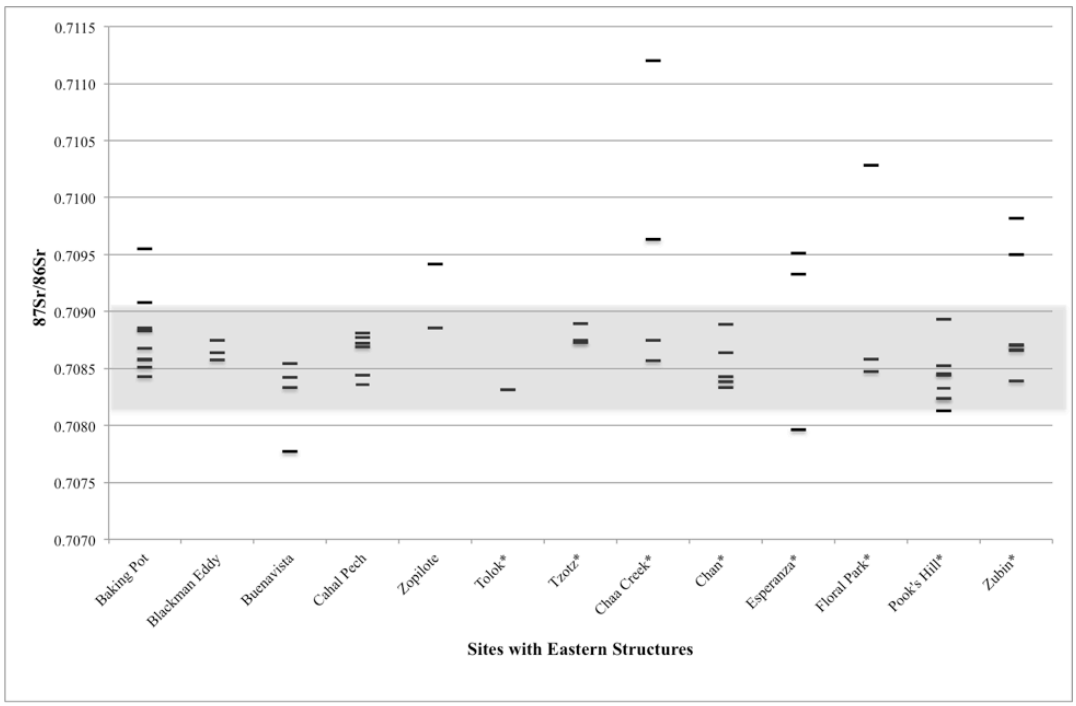

Figure 116. Radiogenic strontium isotope values for individuals interred in eastern structures. Asterix indicates mid-level sites. The gray box indicates the faunal baseline radiogenic strontium isotope range (0.7082 to 0.7091).

Esperanza contained one individual with a significantly lower value than the main cluster of radiogenic strontium isotope values for the site ($^{87}Sr/^{86}Sr$ = 0.7079). This value is consistent with several locations in the Central Lowlands, but nevertheless is not consistent with the Belize Valley or Macal River zones (Freiwald 2011:188). Only one individual at Chan shows a value nearly as low as the one from Esperanza, Burial 14 ($^{87}Sr/^{86}Sr$ = 0.7080), interred in the western structure of the site core. While not the eastern structure, this was still a ritually prominent location.

Upper-level sites with eastern structures are also shown in Figure 116. Baking Pot and Zopilote both had individuals with values that were higher than the main cluster. The individual from Baking Pot is Burial 4 from Structure 215 (BP.215.4.1), an eastern

structure at a plazuela group near the site core (McRae 2004), and had a $^{87}Sr/^{86}Sr$ value consistent with childhood in the vicinity of the Macal River ($^{87}Sr/^{86}Sr = 0.7095$). Burial 4 was closely interred, or possibly commingled, with Burial 6 and both were poorly preserved. Burial 6 also exhibited a $^{87}Sr/^{86}Sr$ value consistent with a Macal River value, although one consistent with locations closer to the coast (Freiwald 2011:198).

The burials from Zopilote are unique. Zopilote is located 500m from the site core of Cahal Pech at the end of a causeway and seemed to serve a nearly exclusively ritual function (Cheetham et al. 1994; Cheetham 2004). The high value belonged to the skull placed within two vessels in Tomb 1 and is consistent with the Macal River zone, as well as the Belize River and Western lowlands ($^{87}Sr/^{86}Sr = 0.7094$).

The site of Buenavista, located in the Upper Belize River Valley, has one individual with a value much lower than the mean for the Belize Valley zone ($^{87}Sr/^{86}Sr = 0.7077$) (Mitchell 2006). This value is consistent with values in the Central and Western Lowlands (Hodell et al. 2004; Wright and Bachand 2009; Price et al. 2008). The individual was interred subsequent to another individual, a young adult male, who had a value consistent with Belize Valley radiogenic strontium isotope values (Freiwald 2011:167).

Freiwald (2011:239) found that the earliest interments at Zubin and Chaa Creek had values that diverged from Late Classic values. The values for these two burials are 0.7084 and 0.7085, respectively, both within the baseline faunal range for the Belize Valley. The later values for Chaa Creek have a mean of $^{87}Sr/^{86}Sr = 0.7093$ and the mean of later burials at Zubin is $^{87}Sr/^{86}Sr = 0.7089$. Freiwald's interpretation of these values is that while the individuals are likely local, they are from a different place with the Belize

Valley zone. The only divergent radiogenic strontium isotope value at Chan, Burial 14, dates to the Late Preclassic period. This supports Freiwald's expectation of differences over time in childhood origins. This individual was not interred in an eastern structure, however.

The earliest interment at Chan was Burial 1 placed in the central plaza during the Middle Preclassic period. The values of both samples taken from Burial 1, a rib fragment and a femur fragment, were very similar - $^{87}Sr/^{86}Sr$ = 0.70854 and $^{87}Sr/^{86}Sr$ = 0.70842 - respectively. The mean of Late Classic burials at Chan is ($^{87}Sr/^{86}Sr$ = 0.70862). The difference at Chan between the Middle Preclassic and Late Classic values are not large enough, in my opinion, to constitute a meaningful difference. Possibly there was a difference between the Preclassic and Late Classic childhood diets, but given that the values are within the baseline range for Chan it may not be a difference that is interpretable as a difference in origin.

Freiwald (2011:143) and Wright and colleagues (2010:173) report that atypical burials, isolated skulls or secondary burials, were more commonly of non-local origin. This is not the case at the Chan site. The one isolated skull, Burial 17, shows local values for both teeth ($^{87}Sr/^{86}Sr$ = 0.70872) and bone ($^{87}Sr/^{86}Sr$ = 0.70847). No evidence of cutmarks or other trauma that may indicate sacrifice was observed on the cranial fragments, which suggests that the skull may have been removed from a grave after decomposition and placed in the cache at the base of the stairs of the western structure of Chan's E-group. Burial 1, mentioned above, was re-entered several times in antiquity (Novotny 2012) and the skull and several long bones were removed. No teeth were available for analysis, but bones analyzed indicate a local value.

Freiwald (2001:319) also reports that individuals with non-local strontium values are twice as likely to be part of a multiple individual burial. This was not consistent with the findings at the two sites studied for this dissertation. There are several iterations of multiple individual burials in the Belize Valley, skulls or long bones included with a single person, multiple whole bodies interred sequentially, a primary individual moved out of the way to make space for a second. In the discussion on mortuary practices this issue will be addressed more completely.

Freiwald observed that Cahal Pech is the only one of the upper-level sites in the Belize Valley that lacks evidence of interregional movement (Freiwald 2011:310). The values from Cahal Pech presented here support this conclusion. Individuals from Burials 7, 9, and 10 all have radiogenic stontum isotope values consistent with the Belize Valley, although there is overlap in radgiogenic strontium isotope values between the Macal River, the Belize Valley, and the Western lowlands. The individuals interred in Burial 7 had grave inclusions that associated them with locations outside the Belize Valley. Particularly interesting are two bone rings inscribed with hieroglyphs linking the owner to kings of Naranjo, a major Maya political power located southwest of Cahal Pech in present day Guatemala (Santasilia 2011:46). Other objects within the tomb include ceramic vessels, jade celts, pectorals, bars, and ear flares, as well as a shell paint pot and bone items of unknown function but which were possibly stylus-like writing implements.

One ceramic vessel from the stone tomb containing of Cahal Pech burials 7.1 and 7.2 is decorated in central Mexican style. While the nature of the relationship between sites in central Mexico and Tikál is unknown, the kings of Tikál emphasized Mexican connections in carved monuments and material culture (Braswell 2003). It is possible that

the individuals in burial 7 resided in the Tikál area in childhood. As a point of comparison, the Chan mean elemental concentrations were notably lower for both elements. Unfortunately, no other elemental concentration data is currently available from the Belize River Valley to further contextualize the Cahal Pech and Chan elemental data.

When the log(Ba/Sr) ratios from bone and teeth are sorted by site the two individuals from the wealthy tomb at Cahal Pech are further distinguished (Chapter 9, Figures 8 and 11). Cahal Pech Burials 7.1 and 7.2 have similar enamel values to each other but are distinct from the rest of the individuals in the data set. The teeth of these two individuals have similar, lower values as bone from Chan but the Cahal Pech bone values are slightly higher. This result may indicate that these individuals changed residential location sometime after childhood and resided there until within 5-6 years of their death (Buikstra et al. 1989). One or both either returned to Cahal Pech late in life or were brought back there to be buried. Teeth were the only elements available from the other two Cahal Pech burials 9 and 10, and the enamel values are similar to the values from the enamel of the tomb occupants. Alternatively, these results could indicate that the dietary composition of the Cahal Pech individuals was different than those at Chan, a smaller, non-elite community.

Other aspects of Burial 7 mark it as divergent from Belize Valley mortuary practices, despite the radiogenic strontium isotope values consistent with Belize Valley baseline values and divergent elemental concentrations. Both individuals were interred in an extended, supine, position, with heads to the north. Those with strontium values consistent with the Belize Valley are typically interred with heads to the south and in a

prone, extended position. A third individual from Burial 7, who was too poorly preserved for biogeochemical analyses, was interred in the tomb first and with head to the south. It seems that the later tomb occupants deliberately were not interred using the traditional burial practice, particularly for individuals in eastern structures.

Baking Pot, Buenavista, and Xunantunich, the other major sites in the valley all have evidence for regional as well as interregional movement. Of particular note is Burial 1 from Structure B1 at Baking Pot, which contained the remains of what was likely a Terminal Classic period ruler whose strontium value is consistent with the Belize Valley zone (Freiwald 2011:195). Seven vessels within the tomb were not produced in the Belize Valley and one was the product of the workshop of a king of Naranjo (Audet 2006:207).

To conclude, the radiogenic strontium isotope data bring up two important points. Firstly, the available data suggest that local birth was not a defining factor for interment within an eastern structure at mid-level sites. In many of these locales, individuals were interred whose dietary history suggests residence in a different location. It is important to note variability from site to site. For instance, at Chan there were only people with radiogenic strontium isotope values consistent with the Belize Valley interred in the eastern structure through time, although one individual interred in the western structure of the site appeared to have spent their childhood elsewhere, or had access to different types of food. Chan differed from other patterns at other Belize Valley sites, too. The isolated skull found at the site center was an individual with a “local” radiogenic strontium isotope value, which was not as common in Freiwald’s sample, and there does not seem to be a divergence in radiogenic strontium isotope values between earlier and

later burials. This underscores the variability found within mid-level sites.

Second, at upper-level sites, like Cahal Pech, residential history did not determine mortuary treatment. That is, two individuals who spent their childhoods and at least a significant part of their adult lives within the Belize Valley were buried at Cahal Pech in a way that ties them to other locations. The elemental concentration data, although preliminary, does suggest that both may have spent time in the central Petén.

Expectation 2: Mortuary Ritual

The mortuary record of the ancient Maya is complex; the ancient Maya did not utilize cemeteries, so human remains are recovered in a variety of archaeological contexts. Contemporary ethnographic and ethnohistoric data show that establishing and maintaining reciprocal relationships between the living and the dead were important for the Maya. It has been well established at sites throughout the Maya lowlands that re-entry into grave contexts occurred. Re-entry by the ruling elite was recorded on stone monuments and has been observed in the archaeological record (Fitzsimmons 2011; Weiss-Krejci 2001, 2003; McAnany 2013[1995])). This practice is associated with the creation and veneration of ancestors (McAnany 2013[1995]). However, less well understood regionally is the extent to which re-entry was practiced by non-elites and how it varied over space and time. Expectation 2 proposes that individuals interred in eastern structures of architectural groups will show more evidence for continued interaction by the living with the deceased body.

There are aspects of the mortuary program at mid-level sites that were consistent with broader Belize Valley mortuary practice including head orientation (south), body

deposition (prone), body position (extended), and individuality (single). Each of these appears to be standard for the Belize Valley, although variation does exist, and they are particularly evident in the burial treatment of people interred in eastern structures. These traits may have been a marker of Belize Valley identity (see also Freiwald 2011). The mortuary variables that best describe interaction with skeletal remains: form of disposal, grave type, individuality, funerary space, articulation, and intrusiveness, reveal several interesting aspects of extended mortuary practice in the Belize Valley. There are three main patterns that will be discussed in the following sections. Firstly, interaction with skeletal remains was not limited to only eastern structures. Disarticulated and disturbed interments occurred within eastern and non-eastern structures about equally (Table 21). Furthermore, interaction focused on retrieval of skulls and re-opening of occupied graves to inter another individual. There were several types of multiple individual burials, as discussed below. Secondly, while some extraction of skeletal remains occurred, creating secondary burials for the purpose of display or veneration was not the apparent goal of mortuary practice in the Belize Valley. Instead, interaction involved retrieving skulls from a few individuals, perhaps opportunistically. Secondary burials were not common. This is supported by data on funerary space – graves were nearly always filled soon after the corpse was deposited so that it would have been difficult to access to the bones. Finally, not only were interments that were disarticulated/disturbed (i.e. showed evidence for having been re-entered by the living) found in non-eastern structures, but round structures in the Belize Valley also were the focus of multiple human interments in the Late/Terminal Classic period. In the following sections I discuss in more detail these

results beginning with a discussion of disarticulated and disturbed interments and their possible significance.

Table 21. Comparison of articulation between structures at mid-level sites.

Structure	Articulated	Not-articulated
Ritual East	24	12
Ritual West	10	5
Ritual Other	1	6
Residence	11	3
Plaza	2	7
Platform	1	0
Midden	1	0

Disarticulated burials within eastern structures of mid-level sites show three types of interaction with the living. First, two of nine disarticulated burials within eastern structures of mid-level sites were part of multiple individual deposits. These two were apparent primary burials that were pushed to the side of the grave to make way for a second primary burial. They were discovered at Chan (CH.5.5.B; Figure 117) and Chaa Creek (CC.OP190P/27.1.B).

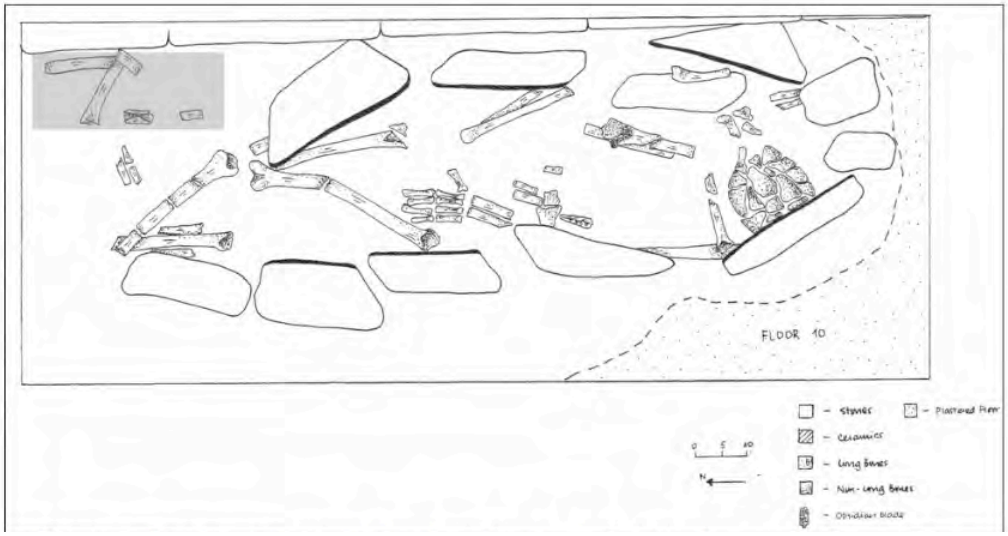

Figure 117. Chan Burial 5. Shaded box indicates remains of a second individual. Drawing courtesy of the Chan Project.

The second type of interaction involved removing just the skull and leaving the rest of the body at Chan and at Zubin. Burial 7 at Zubin (ZU.A1.7.1) consisted of a context that had been re-entered in antiquity, the skull removed, and a cache of vessels placed where the skull should have been. Jade beads found in ZU.A1.7.1 matched several beads in ZU.A1.5.1, a burial placed nearby. The excavator hypothesized that these jade beads were also removed and placed in ZU.A1.5.1 (Iannone 1996). The second type of interaction occurred at Chan (CH.5.8.1) as well (Figure 118).

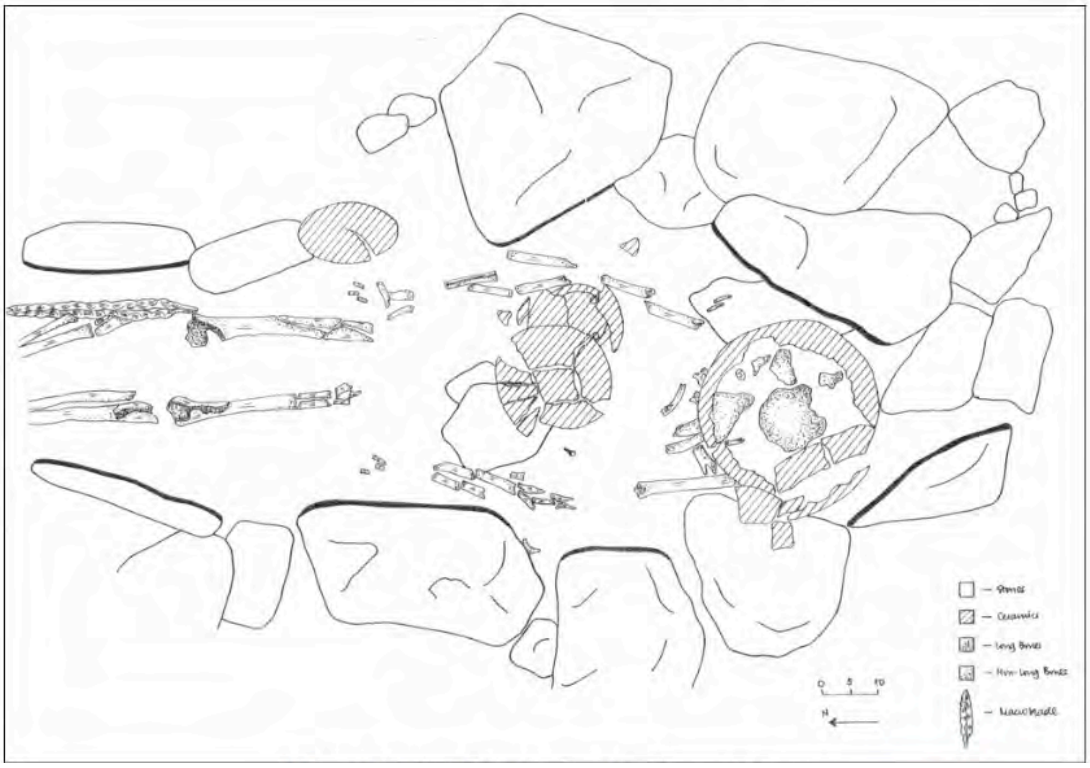

Figure 118. Chan Burial 8. Drawing courtesy of the Chan Project.

Burial 8 was re-entered in antiquity and the skull placed within a ceramic vessel. The third type of interaction also involves multiple individual burials. Burial 3 at Chan consisted of at least three primary individuals stacked on top of each other over several hundred years in the Late Classic period (A.D. 600-800). Two other burials from the site

of Tzotz (TZ.2.92-2.1 and TZ.2.92-4.1) were listed as disarticulated by the excavators and no further context information or drawings were available.

Burials that were disarticulated in non-eastern structures were most commonly part of multiple individual burials. For example, at the Chan site, Burial 16 (CH.7.16.B-C; Figure 119) contained several disarticulated individuals.

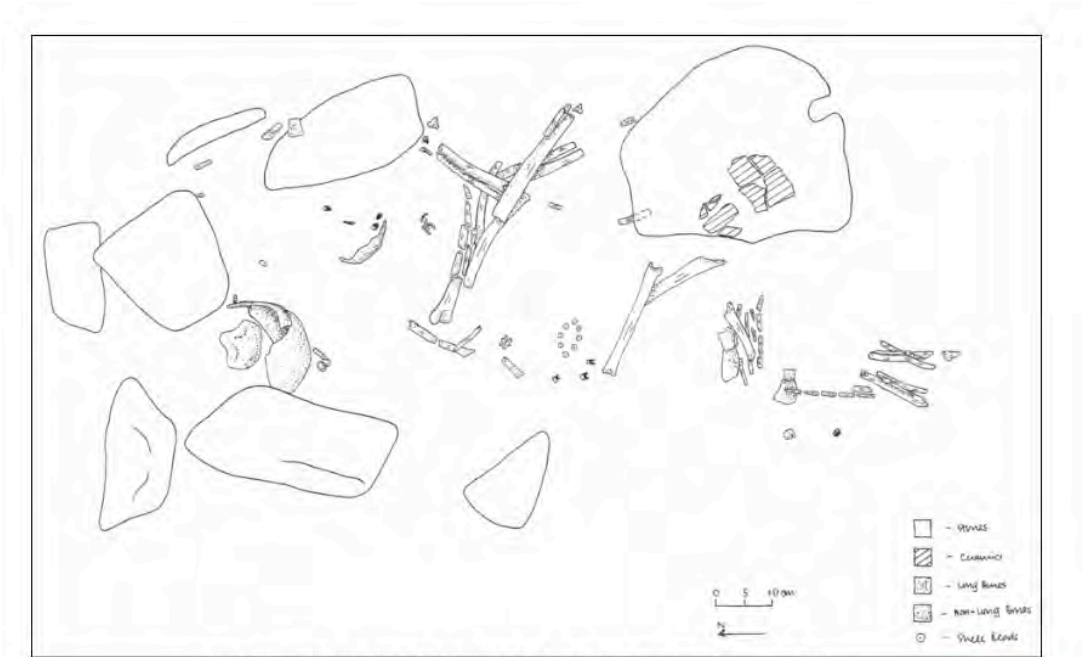

Figure 119. Chan Burial 16. Drawing courtesy of the Chan Project.

Also part of this category are several complex deposits at Chaa Creek (CC.OP161XX/11-12.A-E) that were likely the site of multiple re-entry events causing all but one of the individuals, the first interred, to be disarticulated (Connell 2000, Adams 1998). Interaction with skeletal remains by the living was distinguishable between eastern and non-eastern structures in reference to the practice of removing the skull. This occurred at both locations in the Late Classic period. I interpret these deposits as ancestral interaction, possibly for the purpose of communication. This practice is consistent with

ethnohistoric and modern practices in which a pig skull is displayed and paraded within a ceramic bowl; anthropologists have hypothesized that this may have been a human skull in the past (Astor-Aguilera 2010; Tozzer 1941). However, this is not the only architectural location at mid-level sites at which skulls were targeted. Also at Chan, the burial found in the central plaza (CH.CPL.1.1) had the skull and one upper limb removed in antiquity (Blackmore 2003; Figure 120). Fragments of jade within the grave re-fit fragments found in nearby cache features intrusive into the bedrock beneath the plaza (Keller nd; Kosakowsky et al. 2012).

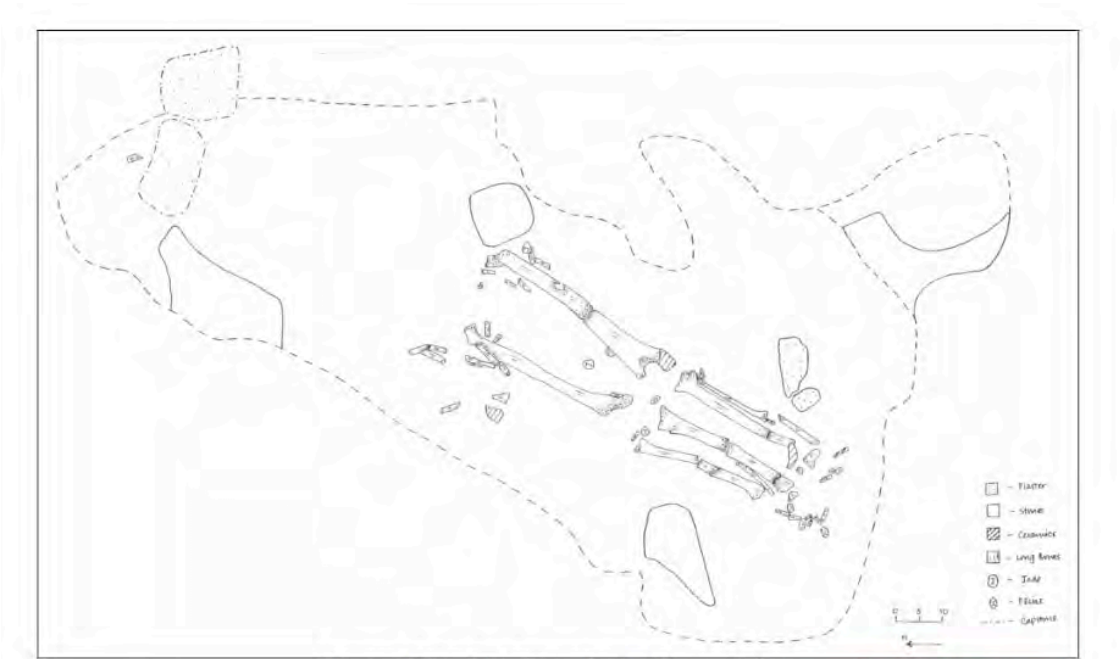

Figure 120. Chan Burial 1. Drawing courtesy of the Chan Project.

The second way that the Maya chose to interact with the deceased body in eastern structures involved multiple individuals placed in the same grave space. There are two types. First, a second individual was placed within an occupied grave space and the first

occupant pushed aside. Second, multiple primary and secondary individuals were placed in the same grave space and stacked up. I think there is a distinction between the multiple individual burials that are stacked and the first type. The first type seems to be more logistic; the intention was to dispose of a second deceased body and the grave was still accessible. These deposits occurred throughout time; the examples above are from the Terminal Preclassic to the Late Classic period. The second type contains more individuals, and for the sites from which there are radiocarbon data, re-entry occurred over a longer period of time. In the case of Chan, for example, there were other interments made at the site during the Late Classic while Burial 3 was used repeatedly. This suggests that the individuals in Burial 3 were placed intentionally in the same grave. I contend that this treatment may indicate that the context was considered ancestral, but that the first type likely was not. Multiple individual interments are discussed in more detail below.

There were few disturbed interments, contexts in which the skeletal elements are not in anatomical position, in both eastern and non-eastern structures. There were three disturbed interments from eastern structures. Two of the disturbed burials from eastern structures were from Cas Pek (CK.1.93-1.1, CK.1.93-2.1), but there was little available context information for them. The third was a set of long bones placed on top of multiple primary interments within Burial 3 at Chan (CH.5.3.A). The dates of the burials at Cas Pek are unknown; Chan Burial 3 dates to the early part of the Late Classic period (AD. 600-670).

Four disturbed graves from non-eastern structures also conform to this pattern of re-entry in antiquity. Burial 20 from Chan (CH.8.20.1) was disturbed in antiquity and the lower legs removed. Burial CC.OP161EE/2.1.1 from Chaa Creek was disturbed, but there was clear evidence of action by rodents. At Saturday Creek, one disturbed burial was an infant (SC.85.4.1; Figure 120) and the analysts maintain that preservation was too good to explain the missing elements, leading them to suggest that the elements were removed in antiquity.

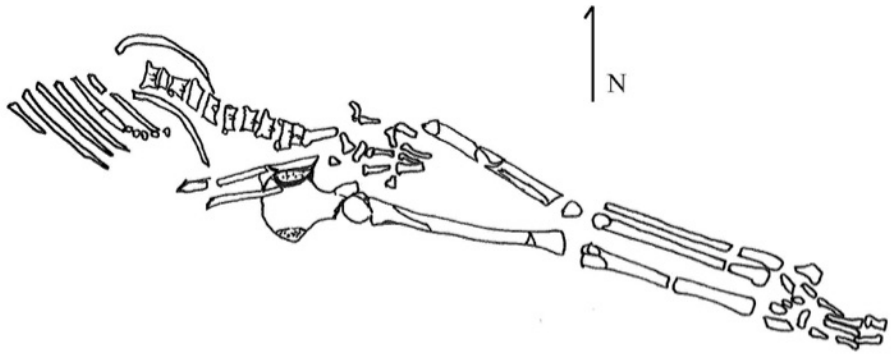

Figure 121. Saturday Creek Burial 9 (Sanchez and Chamberlain 2001; Figure 7.6).

A final example of disturbance from Saturday Creek involves Burial 9 (SC.85.9.1), which was missing the entire body above the os coxae. The lower body was completely intact and articulated. The excavators hypothesize that the upper half was removed during burial of another individual nearby, however missing elements are attributable at least in part to root activity (Lucero et al. 2002:46; Sanchez and Chamberlain 2002). I interpret the preceding examples as accidental disturbances and not actions that targeted human remains for communication with ancestors.

Considering the data reviewed here, the best way to address secondary burials is to use the approach suggested by Duday. Henri Duday's perspective is that a secondary burial is associated with pre-planning (2011:89-92). That is, when human bone is recovered in the archaeological record, the key question is what the intention was in its placement. Basically, one must look for evidence that people were creating a context for secondary burials. We can consider the classic example of secondary burial from Metcalf and Huntington (1991), the case of the Berawan in Indonesia. The Berawan have a clear series of stages through which the body must pass for the soul to be integrated into its new place in the world. This integration parallels the decomposition of the body through to skeletonization. At the end of the soul's journey it is appropriate for the bones to be curated in a jar and placed on a carved wooden platform in the forest. This is a true secondary burial – the end goal was to create a skeleton that was then placed in a particular spot with other skeletons.

The data presented in Chapter 8 do not lead to the conclusion that secondary burials were intentionally created by the ancient Maya. If the ancient Maya were intending to create secondary burials then I would expect to see either evidence of stages of mortuary ritual in the archaeological record or of pre-planning in the form of open funerary space, accessible grave contexts, interments of multiple secondary burials, etc. We do see graves with capstones commonly in mid-level sites, at both eastern and non-eastern structures. This would have allowed the Maya to plan for an exhumation. However, we do not see other signs of pre-planning. The data presented in Chapter 8 show that the majority of interments are primary and articulated (Table 6 Appendix D).

It is difficult to ascertain whether or not seeing pre-planning. I argue that the

strongest evidence for pre-planning is with multiple individual burials. The radiocarbon assays presented in Chapter 9 show that at all of the three site types graves were re-entered routinely over several centuries. At the Chan site, there were other interments made in the same and nearby structures, implying that the particular location was chosen for re-use. Also, most secondary burials are from multiple individual interments. They seem to be a place to gather together human remains, whole and fragmented. It is important to note that specific skeletal elements are found in other contexts, for instance phalanges and skulls in caches. Finally, while the biodistance analyses reported here must be interpreted cautiously, due to small sample sizes and missing data, the results suggest that individuals interred together may not have been biologically related.

There are only two burials that I could reliably call secondary within eastern structures at mid-level sites. Both were from multiple individual deposits that we know from radiocarbon dates were re-entered repeatedly. This variable brings up a major difficulty in interpreting ancient Maya burial practices. In order to define a burial as secondary there needs to be evidence that the burial did not decompose in the location that it was found. Disarticulation or missing elements should not be the only criteria for identifying a secondary burial, although it often is in the literature (Duday 2011). The secondary burials I identified were indeed incomplete, but there was also evidence that they had decomposed elsewhere. For example, the secondary burial within Chan Burial 3 (CH.5.3A) consists only of long bones and there were no smaller bones or teeth that could be matched with these bones to argue that it was primary (Figure 122). I did not excavate the secondary burial from Zubin, but laboratory analysis indicated that it also lacked smaller bones.

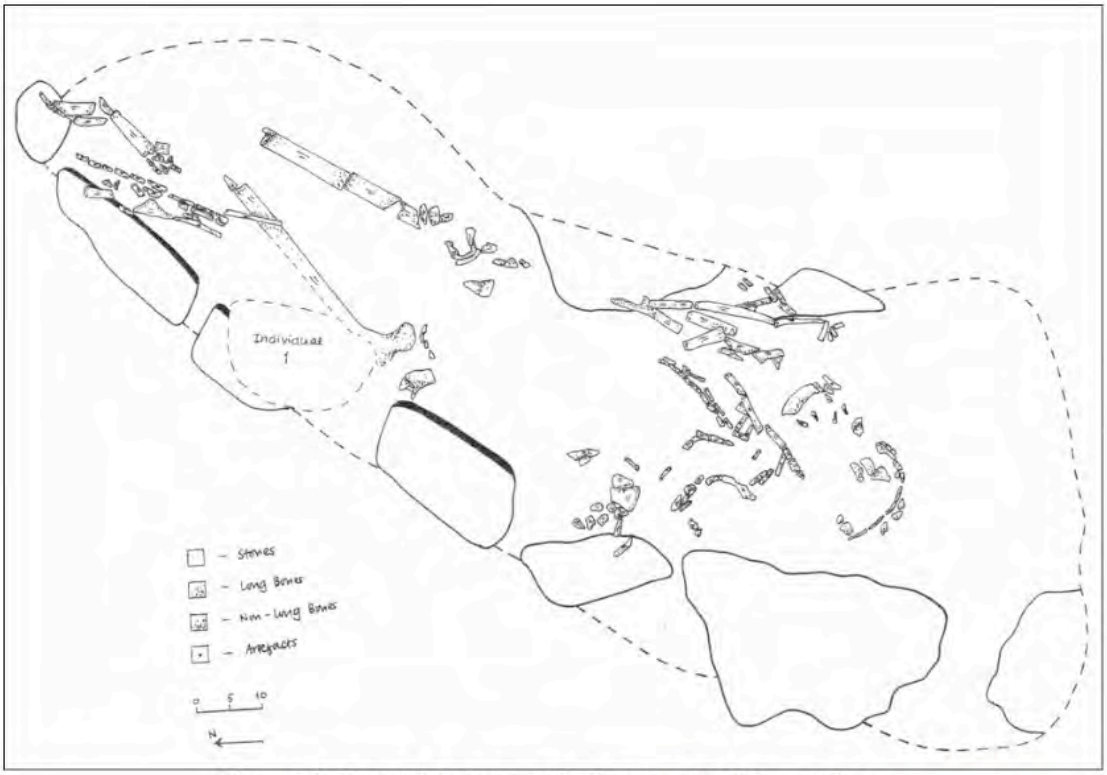

Figure 122. Chan Burial 3.A, indicated by the dashed circle labeled "Individual 1". Drawing courtesy of the Chan Project.

I approached analysis of the osteological material and the published work conservatively. If contextual details were unclear I marked a burial as unknown or indeterminate for the form of disposal category (i.e. primary or secondary). It is possible that secondary burials positively identified in the field were not categorized as such during the analysis, thus decreasing the overall occurrence of secondary burials in the Belize Valley.

There were apparent secondary burials in non-eastern structures at mid-level sites, but these were also in ambiguous contexts. The clearest case was from Chan. Burial 17 (CH.7.17.1an isolated skull placed at the base of the western structure in the central group. It clearly had been extracted from a grave and placed in the deposit. There were

three burials from the site of Tolok (TO.14.9.B-D) in which there were children interred with a primary burial. The bones of children do not preserve well so it is not clear whether these were truly secondary. A final example of complex secondary interments includes human remains recovered from a chultun at Tolok.

The lack of intrusive burials also lends support to the idea that there was no pre-planning for extended interaction. It is commonly stated in archaeological publications on the ancient Maya that burials are interred during episodes of remodeling or the construction of additions to existing architecture (McAnany 2013[1995], Welsh 1988). Thus, we would expect a higher frequency of non-intrusive burials within eastern structures. However, within eastern structures of mid-level sites intrusive burials are the most common through time, from the Preclassic to the Late/Terminal Classic period. Non-intrusive burials do occur, but with much less frequency. In other burial locations at mid-level sites, the pattern of intrusive and non-intrusive burials is similar. In non-eastern contexts intrusive burials are most common, except in the Early Classic period, although it seems like there is a higher instance of non-intrusive burials in non-eastern locations. The more common pattern of intrusive burials in eastern structures may mean that it was important to mark place and landscape through funeral rituals. Mortuary ritual thus likely occurred soon after death, with a grave being dug into existing architecture at mid-level sites in eastern structures.

Interments within eastern structures at mid-level sites consistently intruded into existing architecture. This suggests that burial occurred immediately and did not wait for new construction. It also suggests that burial location was not generally opportunistic; people were not buried in fill because an addition was under construction, but they were

interred in an existing, chosen place. The fact that there are more non-intrusive interments at upper-level sites suggests that funeral events were marked by construction and creation of place on the landscape for rulers. Nearly all burials at lower-level sites were intrusive, as well, suggesting that burial location was chosen expeditiously for disposing of the deceased body.

Table 22. Comparison of general patterns at eastern and non-eastern structures at mid-level sites.

Variable	Eastern	Non-eastern
Deposition	Prone	Prone
Disposal	Primary	Primary
Position	Extended	Extended
Head Orientation	South	South (more variety of orientations)
Individuality	Single (67%)	Single (61%)
Articulation	Articulated	Articulated
Grave type	Crypt	Crypt
Intrusive	Intrusive	Intrusive
Funerary space	Filled	Filled
Age	Adult	Adult (more children)
Sex	Male	Equal

A final piece of evidence concerning pre-planning is that most interments were also not left in open space to decompose. This suggests that there were no future plans for exhumation. These factors suggest that the intention of mortuary ritual was to place the deceased within a landscape, within a particular context, and that those marked places were re-used sequentially for long periods of time. This is also supported by the radiocarbon dates from multiple individual burials at the mid-level sites of Chan and Zubin, and the upper-level site of Cahal Pech. These contexts were used consistently for hundreds of years. This implies some aspect of social memory in terms of the location of the graves and value in placing individuals in the same graves.

The model of eastern structures as locations of ancestors is also assessed here. As

shown above, there are contexts outside of eastern structures that indicate interaction with skeletal remains. At mid-level sites, I used the structures at the sites of Chan and Zubin as models - small temples on the eastern side of a central architectural group and they served a ritual function. This was reasonably clear-cut. At both Lower and upper-level sites, however, defining eastern structures was not so simple. Upper-level sites have more structure types and some of these are on the eastern side of a plaza but are also a residence or were not solely a ritual locale. This was the case at Buenavista and Baking Pot, where burials were placed in the eastern structure of a palace, which is ultimately residential in function. A similar issue was confronted at lower-level sites. Structures on the eastern side of an architectural group whose main function was residential occurred at Barton Ramie (Mound 123). Alternatively, the location in which most of the burials were placed within a group was not the eastern structure but the northern structure, for instance (Barton Ramie Mound 144).

There are also several examples of structures that seemed to be important burial locales but were not eastern structures. Round structures are the best example of this. There are four round structures associated with Cahal Pech, one in the site center, two at Tolok, one at Tzotz. Three of these date to the Middle Preclassic period and Structure 14 at Tolok dates to the Late Preclassic period (Aimers et al. 2000). There were also round structures at Barton Ramie (Structure F, Mound BR-1) and Bedran (Structure BG 2/1st) (Willey et al. 1965; Conlon 1994). The Bedran and Barton Ramie structures both dated to the Early Classic (A.D. 300-600) (Willey et al. 1965:59; Conlon 1994:214). The round structures were circular platforms of varying diameter (about 5-7 meters) and several had outset stairs or patios appended to one side. Two had postholes on their surface, Structure

B4/7th at Cahal Pech and Structure 14 at Tolok (Aimers et al. 2000:75,78) but the other structures surfaces lacked evidence for even perishable superstructure. Burned areas on the plaster surfaces, at Cahal Pech and Bedran, and remnants of copal incense, at Tztoz, suggest a ritual function. They have been interpreted as lineage shrines for the occupants of Tzotz and Tolok as well as performance space, either for ritual communication, or performances of oration, music, or dance (Aimers et al. 2000:81-82).

With the exception of Structure B4/7th at Cahal Pech, which was not well preserved and was also beneath more recent architecture, numerous burials and caches were found within these round structures. The round structure at Tzotz contained 18 burials, and at Tolok contained 9 burials and 4 caches (Aimers et al. 2000:77). Bedran contained 5 burials and 6 caches. Structure F at Barton Ramie contained 5 burials (Willey et al. 1965). All of the burials are intrusive into the earlier architecture; none dated to the periods when the round structures were built.

These structures might suggest another ancestral locale, although Bedran Structure 2/1st was the only one also located on the eastern side of a plaza group (Aimers et al. 2000; Conlon 1994). However, there is no good evidence for interaction with skeletal remains within these structures as we see in eastern structures. I state this with caution, as was unable to analyze the skeletons or documentation from nearly all of these contexts. Unfortunately many of the burials from round structures have been misplaced over the years. No burials from Bedran and only one from Tzotz and two from Tolok were available for analysis. Thus, no biological data on biological relationship nor radiogenic strontium isotope values by which to infer residential history are available. The documentation was also not preserved in all cases. No photos or notes were available

on the early Tzotz burials. No photos were available from Bedran. The notes on Bedran are very good, as are the notes drawings and analyses of material from Tolok and Barton Ramie.

To return briefly to the data on articulation, 35% of the burials from mid-level sites were listed as unknown due to missing data. Missing data plagued the study, as can be seen in the MCA and CA plots of mortuary data in Chapter 8. The reasons for the missing data are many. First, we cannot ever discount preservation and other taphonomic factors in the harsh tropical environment. Second, as exemplified by the data from the round structures, documentation of the burials varied greatly from project to project. In some cases, no report, description, photos, or drawings could be found.

The mortuary analysis presented here suggests that eastern structures were not the only location to which the living returned to interact with the bones of the deceased. It is possible that, based on body treatment, only a few people could be considered ancestors, particularly individuals whose skulls were extracted, as well as multiple individual interments within eastern structures that contain, in some cases, commingled primary and secondary burials. This gathering of people within one grave during the Late Classic, when other burial locations were an option, may represent political move by mid-level sites, in particular. A large population increase occurred in the Belize Valley in the Late Classic and the increase in multiple individual burials may have been a message of community and coherence during a time of change.

Practices with respect to interaction with human remains varied by site, as well. For instance, at Chaa Creek, early in time an eastern structure was the focus of ritual activity while a plaza context in another architectural group was the focus in the

Late/Terminal Classic activity. Elsewhere in the Belize Valley at mid-level sites mortuary ritual was focused on the eastern structures in the Late/Terminal Classic, like at Zubin. At Chan, burials were placed in the eastern structure throughout the site's occupational history. The leaders at each mid-level site had a particular approach and used mortuary practices in a particular way. Chaa Creek was more aligned, according to the ceramic data, with Xunantunich, a major site that was establish in the Late Classic period (Connell 2000). Chan, however, was not (Robin 2012a,b). Their mortuary ritual continued to be focused in the same architectural group, and within the eastern structure, throughout its occupation. Zubin (Iannone 1996) was likely dependent on Cahal Pech throughout the Preclassic period. The establishment of an eastern structure and burials therein coincided with their independence from Cahal Pech and taking on a residential function.

Overall, it is difficult to identify individuals who may have been considered ancestral based on body treatment and burial location alone. The data are extremely diverse. This follows with the ethnographic data presented in Chapter 3. The ancient Maya clearly did not follow a standard dogma when it came to mortuary treatment. Cultural norms and body treatment practices were applied differently given particular historical contingencies. Whether eastern structures or round structures or the center of a plaza, placing human remains anchored space and provided a place to return to over time.

The analysis presented above found little evidence for the type of interaction between the living mid-level leaders and the deceased in the way described by the model. Firstly, graves were predominantly filled with soil after the body was deposited and not left open. Secondly, there were very few secondary burials or primary burials with

missing elements. Thirdly, there were burials in other locations besides in eastern structures. A strict adherence to the model might indicate that ancestor veneration did not occur at these mid-level sites. However, interaction with remains is not the only way that ancestors may have been venerated.

There is regional variation in mortuary behavior to the extent that it is possible that ancestor veneration was represented differently in the Belize Valley than the model presented. In the Río Bec region of southcentral Yucatán, ancestral interments are inferred using McAnany's (2013[1995]) model, but using a more general interpretation. The Río Bec interments were all within residences, rather than associated with eastern structures. These burials were judeged to have been ancestral based on their particular mortuary treatment (grave type and fill, as well as body position), the specific age and sex profile (adult, male), and importance of the location where they were placed (either on the axis of the building or just lateral to the main axis) (Pereira 2013:462). In some cases, graves were left unfilled and the corpse decomposed in open space but the living did not return to re-open them. These burials seemed to, "play a fundamental role in structuring the built space and establishing special connections among the earth, founding ancestors, and the buildings that covered them" (Pereira 2013:464).

While the body treatment of the burials in the Belize River Valley was very different than described for the Río Bec burials, the Belize Valley burials also anchor the built environment, albeit within eastern structures. Perhaps the power in ancestors there was anchoring of a lineage and establishment of place rather than communication through human bone. The depositional history of the eastern structure at the Chan site certainly demonstrates a dedication to placing burials and caches within this particular locale for

1800 years (Robin et al. 2012; Novotny 2012; Kosakowsky 2012).

Even though there is a dearth of evidence for regular interaction with human skeletal remains at mid-level sites in this sample, it is not absent entirely. The skull was targeted for removal in several clear cases (Zubin, Chan) (Iannone 1996; Novotny 2012). While the re-opening of graves for interment of sequential individuals may or may not have involved interacting with remains by removing elements from previous occupants, it indicates an emphasis on interment in a particular locale in a particular building. This may be another example of burials anchoring place within the built environment. The consistent return to place for the purpose of placing human burials may be akin to the philosophy that lent ancient Maya rulers their authority – that the kings increased their *k'uh* through repeated ritual action (Houston and Stuart 1996; Houston et al. 2006). Not only did it demonstrate their power, correct performance built their inherent heat and vitality. This discursive relationship with power through ritual was perhaps represented through repeated mortuary ritual, within a structure or within a grave. A comparison to elite practices of re-entry and interaction with remains may clarify the frequency and timing of these rituals.

The data on tomb re-entry and visitation comes from the epigraphic record (Fitzsimmons 2009:144, Table 5; Eberl 2005:113-114, Table 3.4). There are only two cases in the ancient Maya lowlands where the archaeological and epigraphic data coincide in the matter of tomb re-entry – the MotMot tomb at Copán and Piedras Negras Burial 13 (Fitzsimmons 2009:145). Neither record is complete. Not only are monuments looted but there is no way to know if these rituals were consistently recorded in hieroglyphs. Of course, the archaeological record has its own interpretive difficulties,

including looting, poor preservation, or poor documentation.

The epigraphic record shows that re-entry rituals occurred throughout time. The earliest inscription referring to a re-entry event is from Copán, located in western Honduras, dating to A.D. 441. The most recent dates to A.D. 799 and was recovered from Tonina, located in the far western lowlands in Chiapas, Mexico (Fitzsimmons 2009:142). There is variation across the Maya lowlands in where these types of re-entry rituals occurred. In fact, the western Maya lowlands seem to have more instances of tombe re-entry than, for instance, the central lowlands. From Fitzsimmons' list of tombs that were "unequivocally royal and reentered" (Fitzsimmons 2009:142), 10 of the 17 (58%) are from sites in the western lowlands (Fitzsimmons 2009:144). There is variation in how frequent the inscriptions occurred. At Copán, there are three and they all date to the Early Classic. At Tonina, there are four and the date from the Early Classic (A.D. 589) to the late Late Classic (A.D. 799). Piedras Negras and Tonina, both located in the western lowlands, each have four unequivocal instances of tomb re-entry over their dynastic history. The Piedras Negras dynasty, which was founded in A.D. 297 and came to and end in approximately A.D. 808, consisted of eleven rulers, some named and others whose names are unknown. If four have re-entry events then 36% of rulers had tombs that were re-entered over the course of the Classic period (Sharer and Traxler 2006:422, Table 8.3). The dynastic chronology of Tonina reports twelve rulers, which indicates that 33% of rulers were the subject of re-entry events by their descendants (Sharer and Traxler:474, Table 8.6).

There are no lists of leaders for mid-level sites or inscriptions but we can take the Chan site as an example. There were 25 individuals from 19 mortuary contexts in the

Chan site center (Novotny 2012: 231). Of these 19 contexts, two were unequivocally re-entered – Burial 1 in the central plaza and Burial 8 in the eastern structure, structure 5. If the three multiple individual burials are included in the count, then the frequency of mortuary contexts being revisited increases to 26%. Again, not as many the elite contexts, and stretched over a longer amount of time.

There was also variation in what occurred when the tomb was opened. Inscriptions and archaeological data are useful here. Inscriptions refer to *och k'ahk'* "fire enters" or *el naah*, "house-censing", another reference to fire. There are other references to fire that are used less commonly, *puluuy u tz'itil*,"[it] burns, his long object" (Fitzsimmons 2009:144). In cases where there is archaeological data, bones were painted with red pigment. In one inscription, the tomb of a Copán king, B'uutz' Chan, was described as having his bones cut and scattered; neither his tomb nor a set of remains that meet these criteria have been recovered (Eberl 2005:114).

Of Fitzsimmons' (2009:144) list of unequivocal re-entry events, there is only one instance of missing bones, Piedras Negras Burial 110, although six (35%) are described as having been disturbed. Twice, at Piedras Negras and Caracol new interments were placed within already occupied tombs. Caracol itself deserves particular mention, as it seems that multiple individual interments were the norm rather then the exception there (Chase and Chase 1994, 1996a; Chase 1998, 2011). About 60% of the tombs at Caracol were constructed with formal entrances, presumably to facilitate re-entry (Chase and Chase 1994).

Interestingly, there is an inscription from Yaxchilan, located in the western Maya lowlands along the Usumacinta River, which states that a "fire-entering" event occurred

“at the white stone place, her tomb” of Lady K’ab’aal Xook. The inscription was located in a different location than the tomb of Lady K’ab’aal Xook, and that tomb was not reported as having been re-entered. This may suggest that an ancestral shrine was the location of the “fire-entering” and not her tomb (Fitzsimmons 2009:223, note 1).

Ancestor veneration is visible in other ways besides tomb re-entry among the ancient Maya dynasts. At several Maya sites, the funerary temples of deceased kings became important locations on the landscape, to the extent that their monuments anchored future construction in the site center. These include K’inich Yax K’uk’ Mo’ of Copán, Yax Ehb’ Xook of Tikál, and K’inich Janaab’ Pakal I of Palenque (Fitzsimmons 2009:60). Even these kings, who were the subjects of the most elaborate funerary treatment in the Maya lowlands, showed variation in their treatment. For example, K’inich Yax K’uk’ Mo’ was placed in a funerary pyramid that was covered sequentially with larger pyramids, some containing other interments (Bell et al. 2004). The pattern at Tikál, on the other hand, was to create a “compound” of funerary monuments anchored by that of the founder (Fitzsimmons 2009:112). The location of mortuary treatment for royal dynasties also changed over time. At Tikál, the architectural complex called the Mundo Perdido was used as the burial location for Tikál kings from the Early Classic. This dynasty seems to have fallen on disfavor and, after a hiatus in power marked by a lack of construction and carved monuments, a new dynasty reinvigorates the city. These kings, and their decendants, were buried in the north acropolis from approximately A.D. 400-700 (Fitzsimmons 2009:113).

Driving variation in mortuary treatment in the central lowlands was also the personality of each ruler. Fitzsimmons (2009:120-123) discusses the reign of Bird Jaguar

IV and how he emaphsized repeatedly his legitimacy by commissioning carved stone monuments alluding to his lineage and depicting him conjuring his ancestors in bloodletting ceremomies. At no other site are the iconographic and epigraphic representations of ancestral communication so obvious. Fitzsimmons (2009:122) argues that Bird Jaguar IV was likely lobbying for remembrance as an ancestor himself.

What are the implications of this for the model of ancestor veneration provided in Chapter 5 and its links to sociopolitical organization? Interaction with skeletal remains among mid-level sites was not as frequent as the inscriptions show for the royals, unless one considers returning to multiple individual interments as a form of re-entry, particularly in the Late/Terminal Classic.

In conclusion, there was less evidence than initially expected of interaction with skeletal remains by the living with eastern structures at mid-level sites. However, this does not mean that veneration or communication did not occur at all, but mid-level leaders may not have focused on human bone as a ritual object. Comparison of the Belize Valley mortuary practices to those within other regions, such as Río Bec, and of other social groups, such as the Maya elite, which are interpreted as ancestral, suggests that there was a lot of variability in mortuary expression in ancestral contexts. One aspect of Fitzsimmons' (2009) study of the Maya royal that rung true for the non-elites as well was that mortuary treatment marks a distinct place on the landscape. While re-entry may not have factored as strongly in these rituals, the continual placing of bodies within the built environment most likely established place in a discursive way for the occupants of mid-level sites.

Expectation 3: Community Kinship and Social Organization

Biodistance data were collected to test expectation 3, that individuals in eastern structures were more closely related to each other than to individuals not in eastern structures. This expectation could not be effectively tested due to poor preservation, resulting in considerable missing data. Individuals and traits with more than 50% missing data were culled from the analysis leaving merely 60 individuals from 12 sites dating to the Late Classic period for the analysis. Only a few of these individuals were actually from eastern structures. In addition, partitioning the sample into eastern or non-eastern structures was not possible, as it would have further diminished the sample size and precluded statistical testing. Thus, distances between individual sites were compared.

It was found that dental size variables were quite homogenous within the Belize Valley. This pattern in similar to that reported by Andrew Scherer in his biodistance study, using dental data from Classic sites through the Maya Lowlands. Scherer (2004) and Wrobel (2003) both found that the data from the Belize Valley were distinct from other sites in their respective samples, which lead me to believe that there may be enough heterogeneity within the Belize Valley to distinguish certain sites from each other. The results show that the metric data presented here are rather homogenous. However, only cervico-metric variables were collected, so a dataset with more variables may have produced different results.

One surprising result was that the site of San José was not biologically distinct from the rest of the sites in the sample. This is interesting because it is geographically distinct, and the burial practices are much different, which was why it was chosen for

comparison. While burial in a prone, extended position with head to the south is the common burial practice in the Belize Valley, at San José nearly all of the burials are flexed and on their sides (either right or left).

There were several sites whose values fell just over the cut-off for significant difference – Actuncan, Baking Pot, Barton Ramie, Chaa Creek, and Zubin. This loose pattern might indicate less gene flow between these sites. Actuncan, Zubin, and Chaa Creek are, in general, geographically closer to each other, in the Upper Belize River Valley than they are to Barton Ramie and Baking Pot. Barton Ramie and Baking Pot are located closer to each other in the Middle Belize River Valley. Actuncan only had three values for this analysis, so the small sample size may be the reason for the apparent distance.

In the PCA plot, Barton Ramie did appear to be slightly distinct from the rest of the sample. While there are Barton Ramie individuals in the central cluster, the majority is dispersed to the left and lower parts of the plot. Barton Ramie has the largest sample size in this study (n = 17) so it may seem distinct by virtue of having the most variation due to sample size. These data came from five different house mounds at the site – 123, 130, 135, 144, 155, and 75 – all of which were part of plazuela groups (Willey et al. 1965). All burials were single individual interments and none had any other features that made them stand out from other interments at the site.

One interpretation of multiple individual interments is that they were family graves (Hammond et al. 1975). In the PCA plot (Figure 123) individuals interred in the same grave do not fall closer to each other than to other individuals. The Zubin sample consisted of seven individuals, five of who came from the multiple individual interments

in the sites' eastern structure, Burial 3. When the burial numbers are plotted on the PCA scatterplot the individuals interred within Burial 3 do not cluster together. Individuals from Burial 3 are marked by the red dots in Figure 123. Neither do the two individuals in Xunantunich Burial A4, indicated by the blue dots, although this is likely not a family interment as it consisted of multiple skulls placed in a bench (Audet 2006). The individuals from the multiple individual interment at Chaa Creek (Op161Q) are also somewhat dispersed, indicated by the green dots, although one individual from Op161Q falls close to Chaa Creek Burial 1 from Op 245B. As discussed above, this dataset is compromised by small sample sizes and general homogeneity so this pattern needs further assessment.

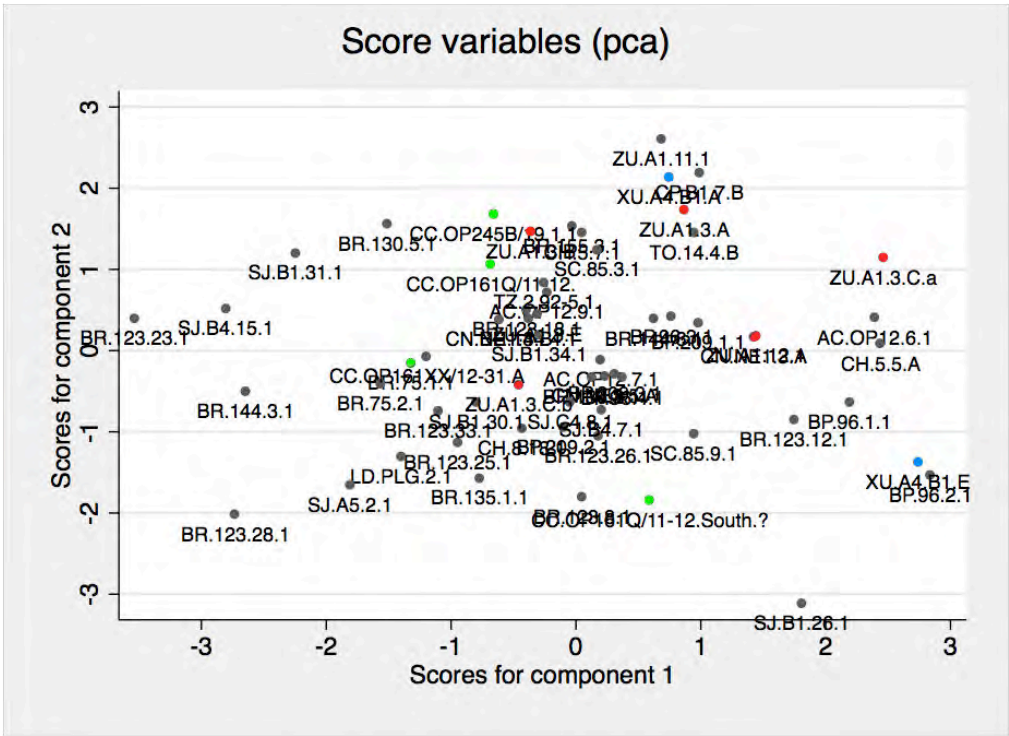

Figure 123. PCA scatterplot of dental metric data with burial identification numbers.

Comparison of strontium isotope values does not clarify the general homogeneity in the biodistance results. For example, a burial from Barton Ramie, BR.123.18.1 was the only individual from that site to have a strontium value that departed from the site mean of .70843 (Freiwald 2011:210). This individual had a value of 0.70916, a value consistent with residence in the Macal River zone; thus they were not local to Barton Ramie (Freiwald 2011:213). Burial 18, however, was in the center of the PCA plot suggesting no genetic distinction, between this individual and the other Barton Ramie individuals. In addition, when interred in Mound 123, they were placed in the Belize Valley style – prone, extended, head to the south – with four vessels, a bone needle, and a pendant (Willey et al. 1965). This suggests gene flow in the Late Classic period between the Maya Mountains and the central Belize Valley coupled with residential mobility of children, and likely their parents.

Individuals with strontium values consistent with residence in the Macal River, just outside the Belize Valley, did not cluster close together on the PCA plot.. One individual from Zubin (ZU.A1.3.Ca) had a radiogenic strontium isotope value of $^{87}Sr/^{86}Sr$ = 0.7981 (Freiwald 2011:184); he was also interred in a prone, extended position with head to the south. They did not cluster on the PCA scatterplot with any of the individuals who also had high strontium values. Finally, one individual from the bench deposit in Structure 4 at Xunantunich had a value of 0.7094, also consistent with the Macal River zone. They also did not cluster with any other individuals with these higher strontium values.

In conclusion, expectation 3 could not be tested as originally proposed ultimately due to poor preservation. However, these types of analyses should not be discounted in

future research designs. Excavations continue as do recovery of human remains; it may be that in the future we will have a data set large enough to assess population history. Another avenue for research is analyses of non-metric traits. Other researchers working with ancient Maya mortuary data have recognized rare traits within small samples of skeletons and used these data to argue for a familial relationship (Duncan 2009, 2011).

Expectation 4: Change over time

Practices with respect to interaction with human remains varied through time and by site. At Chaa Creek, early in time an eastern structure was the focus of ritual activity while a plaza context was the focus in the Late/Terminal Classic. Elsewhere in the Belize Valley at mid-level sites mortuary ritual was focused on the eastern structures in the Late/Terminal Classic, like at Zubin. At Chan, burials were placed in the eastern structure throughout the site's occupational history. The leaders at each mid-level site had a particular approach and used mortuary practices in a particular way. Chaa Creek was more aligned, according to the ceramic data, with Xunantunich, a major site that was establish in the Late Classic period (Connell 2000). Chan, however, was not (Robin 2012a,b). Their mortuary ritual continued to be focused in the same architectural group, and within the eastern structure, throughout its occupation.

The practice of placing the deceased in eastern structures only slightly pre-dates the establishment of kingship in the Maya lowlands, so which is consistent with McAnany's (2013[1995]) model that the Classic period kings appropriate and politicized ancestor veneration. At Chan, the earliest interments in the eastern structure date to the Late Preclassic period (350 B.C. – A.D. 150) (Kosakowsky 2012:44). The earliest burial,

however, is in the central plaza and dates to the Middle Preclassic and exhibits several re-entry events (650 B.C. – 350 B.C.). There are several other plaza burials with missing skulls that are coming to light in the Belize Valley (Brown 2015). Perhaps these plaza burials are in some way "founders" of the non-elite lineages.

Interaction with remains seems to have taken place more commonly within multiple individual burials, particularly in the Late/Terminal Classic. There is a regional and temporal trend in the occurrence of multiple individual burials, which was first identified by Schwake (2008). When all time periods are taken into account, Schwake reports that 40% of the burials in the Vaca Plateau region, located southwest of the Belize Valley, contained multiple individuals. Neighboring regions show a much lower percentage of multiple individual burials (southeast Petén 10%, Belize Valley 14%). In her count of individuals she finds 34% of individuals were in multiple burials in the Belize Valley, similar to my finding. In particular, she finds a dramatic increase in the occurrence of multiple individual burials in the Late/Terminal Classic period (Schwake 2008:270). She concludes firstly that multiple interments consist of ancestors that underlie political power, and secondly that these deposits are expected at times of sociopolitical transformation (see also Iannone 1996). Thirdly, she suggests that the Vaca Plateau sites were more heavily influenced by the Central Petén and that the southeast Petén and Belize Valley, connected by riverways, had distinct sociopolitical and ideological organization.

While Schwake (2008) states that the increase in multiple individual interments was not seen as strongly in the Belize Valley as in the Vaca Plateau, the data presented here suggest there was a slight rise in the occurrence of multiple individual burials there

too. Among all sites in the Belize River Valley, 30% of individuals were placed in multiple individual interments during the Late/Terminal Classic period, compared to 25% in the Terminal Preclassic and the Preclassic combined. Of the nine Preclassic individuals, five were children. Interring children with other individuals is a practice that has been previously noted (Welsh 1988) and might have been the "correct" way to treat deceased children. If these are not counted, then there is an even greater increase in multiple individual burials between the Preclassic and the Late Classic.

I agree with Schwake that interments containing multiple individuals may have been created to foment and underscore political power in this part of the Maya region. The opening and re-opening of a grave space creates memories and establishes the grave as a distinct location on the ancient landscape. The best evidence for consistent tomb re-opening and re-entry comes from multiple individual burials by way of the radiocarbon assays. Furthermore, this is the only context in which true secondary burials are repeatedly found. They seem to give the best evidence for a context in which prolonged interaction with the remains of the deceased took place. Many of these interments are in eastern structures, but not all.

In the Belize River Valley, there was a distinct change in burial practices after the "collapse" of the lowland Maya sociopolitical system during the Postclassic period (~A.D. 1000-1500). Within three residences at Baking Pot, three burials, two male adults and one infant, were excavated that dated to the Late Postclassic period (A.D. 1280-1420) (Hoggarth 2012:3-4). None of these individuals were placed in a prone position with heads to the south, as was typical for interments in the Belize Valley in the preceding time period, the Late/Terminal Classic. Of the two adults, one was flexed and one was

partially flexed and supine, and both oriented northward (Hoggarth et al. 2014). Both of two individuals had radiogenic strontium isotope values that were outliers for the Belize Valley (Hoggarth et al. 2014:5). Both individuals have radiogenic strontium isotope values consistent with childhood residence in the central Maya lowlands (Hoggarth et al. 2014:5).

These bioarchaeological lines of evidence suggest a re-occupation of the Belize Valley in the Postclassic period rather than continuous occupation (Hoggarth et al. 2014:7). Quality and style of Postclassic residential architecture also depart from Classic period patterns and material culture consistent with Postclassic occupants have been recovered at Baking Pot, include ceramic types and varieties as well as a mask possibly representing the merchant god (Aimers 2004; Audet 2002; Hoggarth et al. 2014). Several other burials dating to the Postclassic have been recovered from Baking Pot, but their contextual data are sparce (Ricketson 1931; Hoggarth et al. 2014).

The body position of the Postclassic burials at Baking Pot is consistent with positioning of burials at Postclassic sites in northern Belize. Two were flexed and on their sides and one was flexed and in a seated position (Chase and Chase 1988:54). Another set of burials from another structure consisted of two isolated skulls and one flexed, seated individual (Chase and Chase 1988:64). Postclassic deposits from the central Petén (Duncan 2005) suggest a focus on warfare and trophy taking in the Postclassic period. Bishop Diego de Landa, whose account of the customs of the Yucatec Maya during the contact period is used extensively by archaeologists (Tozzer 1941), indicates that the lords were cremated at this time. Cremation seemed to occur in other parts of Mesoamerica but remains uncommon even in the Postclassic and Colonial periods (Chase

and Chase 1992:127). Chase and Chase (1988:128) suggest that Postclassic ritual resided even more in the hands of the elite than in the hands of both elite and commoner, as it did for the Classic period Maya, at least in northern Belize. At Santa Rita Corozal, only elite residential or elite-nonresidential contexts had material culture associated with ritual, such as censers.

The Postclassic period is not well represented in other parts of the Belize Valley, in material culture or human burials. At the Chan site, an altar dating to the Terminal Classic/Early Postclassic was recovered in the center of the Chan central plaza (Kosakowsky et al. 2012:305). The altar was constructed over the earliest burial and cache at Chan (Blackmore 2003). Several caches were also recovered that dated to this time period (Robin et al. 2012:130). This does suggest that the social memories created slowly over time at the site center resonated with later occupants.

Conclusion

The results discussed here create a more nuanced portrait of ancestors and ancestral practices at mid-level sites in the Belize River Valley. The model of ancestor veneration constructed succinctly by McAnany (2013[1995]) has been interment within the structure located on the eastern side of an architectural group (see also Becker 1971; Chase and Chase1994; Chase 1998). As the living were expected to continue to communicate with and participate in the existence of the deceased, it was expected that a higher incidence of manipulation and extraction of remains would be seen in these eastern structures. It was also expected that those interred in eastern structures, as leaders in life, were more likely to have been had strontium isotope values consistent with

childhood residence in the Belize Valley. They were also expected to have been part of the same biological lineage.

The data presented support the initial premise that eastern structures were likely the scene of protracted posthumous rituals. The frequency of disarticulated and secondary burials is higher in eastern structures than in other locales, although eastern structures are not the only loci of these types of deposits. Round structures were also a focus of mortuary behavior in the Late/Terminal Classic period at some sites in the Belize Valley. Overall, it does not seem like secondary burials were regularly and purposefully created for use as ritual objects or display. Certainly, this occurred; there are several instances of isolated skulls in caches or placed with other individuals in burials as well as skulls missing from otherwise undisturbed interments. The mortuary program generally seems not to have been concerned with timed mortuary stages wherein bodies are interred in one location until skeletonization is complete and then removed to a second location. Future research should continue to address this, however, as there is hieroglyphic evidence that interment and re-visitation of tombs by Maya royals occurred in stages (Eberl 1999).

Radiogenic strontium isotope data enrich this analysis by showing that eastern structures were not a burial locale exclusive to individuals who spent their childhood in the Belize Valley and may have been considered “local”. Data from upper-level eastern structures also suggests that within that part of society local birth did not guarantee interment in a local manner; perhaps the network created during one’s life shaped treatment in death more than residential origin.

Finally, biological relatedness and its relationship to mortuary treatment remains vague. Future research should focus on the collection of dental metrics other than cervico-metrics. Non-metric data could also contribute to this aspect of the research.

CHAPTER 11: CONCLUSION

In concluding this work I return to the concepts developed in Chapters 2-4, namely reconstructions of ancient Maya worldview, power, practice theory, and sociopolitical organization. The results of the study are summarized and presented in light of McAnany's (2013[1995]) model of ancestor veneration and are contextualized within the broader ancient Maya sociopolitical landscape. The concluding section highlights contributions of the present work to the study of ancient Maya mortuary contexts that are also relevant to the study of mortuary programs in other cultures. Scholars are encouraged to refine and extend these conceptual and methodological tools to reconstruct past mortuary practices.

According to ethnographic and ethnohistoric data, Maya thought and action revolve around maintaining a balance in the universe, a cosmic order in which they exist in relation to all other beings (Fischer 1999:480; Knab 2004:9, 20-21, 38; Monaghan 1998). The reciprocal relationship between the dead and surviving members of a community follows from this core belief. The living have a duty to care for the essence of the deceased and maintain a connection with it so that it will be peaceful in the underworld and inclined to, in turn, assist the living. Maya worldview is characterized by an integration of the natural with the supernatural and is shaped by observations of the natural world, the cycle of the seasons and the physical reality of biological death (Astor-Aguilera 2010; Furst 1995).

The fundamental rule for membership in contemporary traditional Maya society is community participation (Astor-Aguilera 2010; Fischer 2001; Monaghan 1998;

Watanabe 2004). Participation is perceived as contributing to the renewal and regeneration of the community through agricultural and human reproduction. Relationships among community members can be characterized as reciprocal – proper care and communication brings favorable outcomes while neglecting responsibilities of care and communication can bring detrimental consequences like sickness and crop failure. Parallels to this relational worldview are recognized in the ancient Maya archaeological record, particularly within the iconography and epigraphy of elites wherein they are depicted conjuring non-human beings (Houston et al. 2006). The ability to conjure and communicate with deceased ancestors was one aspect of political power for the ancient Maya (Houston and Stuart 1996). Ancient Maya worldview is naturally analogous to the ideas proposed in practice theory; the social world is constituted and reconstituted, recursively, through participation and interaction by human and non-human beings (Giddens 1979, 1984; Bourdieu 1990; Sahlins 1985; Ortner 2006).

At a broader level, social structures, constituted by cultural schema, the cultural rules that are followed in practice and reconstituted through action, and resources, physical or knowledge-based means by which the rules are followed, shape how that participation and interaction are materialized in the archaeological record (Giddens 1979, 1984; Ortner 2006). Participation in schemas and use of resources are mutually sustaining when performed over time (Sewell 1992:19). Knowledgeable actors draw on their schema and resources, both specific to their social and historical context, and can maintain the status quo or create new structures. Such models are useful for interpreting ancient behavior because the resources used to materialize cultural schema are observable in the archaeological record.

The model for sociopolitical organization detailed in Chapter 4 argues for ancient Maya landscape of kings residing in large, urban centers whose power, in part, was based in a relational worldview. Kings claimed power based on their lineage, mythical or biological (Fitzsimmons 2009:116) and came to be personally and politically powerful based on effective ritual performance. By virtue of the strength of their life essence, the *k'uh*, they were able to perform rituals, particularly those concerned with communicating with ancestors, and, discursively, the *k'uh* made more potent by successful ritual performance. The idea of an ancestor, a deceased forebear who McAnany (2013[1995]:147) describes as "famous and just" who may have been of a particular age or sex and was given distinguishing mortuary treatment, has deep roots in ancient Maya philosophy and veneration likely began among commoners in the Middle Preclassic period. As kings rose to power, the lineage-based social organization represented a challenge to their political power. McAnany (2013[1995]) argues for the importance of ancestors within the competitive sociopolitical landscape of the ancient lowland Maya, where lineages may have fractured into disputing, rival factions. In this model, power was fraught and unstable, from king to commoner. Ancestors were one means to legitimization.

These kings ruled over polities of varying degrees of sociopolitical integration. In turn, sociopolitical integration seems to have varied widely over time as well (Marcus 1993). Cities like Tikál, Calakmul, and Caracol were evidently highly centralized and the state maintained a widespread bureaucracy, evidenced by as yet indecipherable titles in hieroglyphic inscriptions, which controlled labor, food production, long distance trade, and possibly other resources like water (Chase and Chase 1996b; Chase et al.1990;

Sharer and Traxler 2006:713-714). Regions such as the Mopan River Valley, the Belize River Valley, Río Bec, and possibly others, lack decisive evidence for a highly centralized sociopolitical system. Instead, settlement patterns tend to be more dispersed and minor centers, at least in the Belize and Mopan River Valleys, relatively common. Since ancestor veneration was a means to legitimate sociopolitical power, it follows that it may have been used by the non-elites in regions where there was a lesser degree of sociopolitical integration. In the following section, I summarize results of the study before addressing the applicability of the model for the Belize River Valley.

Ancestor Veneration in the Belize River Valley

The extensive excavations of the Belize River Valley provide the unique opportunity to investigate mortuary behavior and its link to ideology and power among commoners at mid-level sites. No other sample of skeletons in the Maya lowlands includes so many individuals from non-royal, non-elite contexts. The fact that larger centers, upper-level sites, divided political power and there was no single overlord until the Late Classic period makes the Belize Valley an ideal location to study the manipulation of ideology among commoners because it seems likely that the social context warranted them the flexibility to do so. Sites from all levels of the settlement hierarchy were examined for comparison. It also allowed me to test expectations for how ritual and ideology at mid-level sites may have changed in the face of larger political transformations.

In this research, mortuary treatments were expected to vary according to residential history and lineage membership. In addition, burial within eastern structures

was expected to have been associated with increased levels of post-depositional attention for purposes of communication with deceased ancestors (McAnany 2013[1995]). These expectations were tested using bioarchaeological methods of radiogenic strontium, biodistance, and mortuary data. The particular agents examined here are the ancient Maya of the Belize River Valley, with a particular focus on the behavior of the leaders of mid-level minor centers.

Human agency was explored in this dataset, focusing upon the manner in which bodies were treated after death. The normative mortuary schema for the Belize Valley, as researchers have noted since the 1960's (Willey et al. 1965), is that the deceased was placed in an extended position, prone, with head to the south. The Maya residing within the particular communities identified here participated in this schema albeit with some degree of variation.

Leaders at the mid-level sites studied here treated bodies consistently through the Classic period, particularly those interred in eastern structures. Individuals were placed in a prone position, face down, with head to the south. Body treatment and facilities varied more in non-eastern structures than in eastern structures. Age and sex showed no strong association with interment in eastern structures. Males were better represented, but just slightly, within eastern structures throughout time. While many people interred in eastern structures had strontium values consistent with local birth, not all did, making residential history not a good predictor of burial location. Interaction with bodies through secondary burial appears to have been minimal, although re-opening graves to include multiple primary interments was common in eastern structures, and became more common over time. The fact that some graves were re-opened several times, over as much as 200 years,

suggests some degree of record keeping or advanced planning. This suggests that leaders at mid-level sites, in the language of practice theory, implemented ephemeral as well as physical resources in mortuary rituals. This models mid-level sites as cosmologically knowledgable centers that anchored surrounding settlements. At the Chan site the change from graves containing one individual to graves containing multiple individuals in the Late Classic was interpreted as a shift to emphasizing community creation and integration (Novotny 2012; Kosakowsky et al. 2012). A shift to emphasizing community through creating multiple individual interments may have been rooted in the population increase experienced within the Belize Valley during the Late Classic period.

The ancient Maya who populated upper-level sites were also consistently participating in the schema of mortuary treatment in body placement and orientation: placed prone, extended, and head to the south. Their participation varied much more than interments at mid-level sites, particularly in head orientation and burial location. The Maya at upper-level sites did not use the prone position consistently as their counterparts at mid-level sites. The supine position was most common in the Late/Terminal Classic in non-eastern structures at upper-level sites, suggesting elites did not adhere strictly to the mortuary schema described above. The supine position is common in the central Petén part of the Maya area (Coe 1990; Moholy-Nagy 1997). Perhaps Belize Valley elites were associating themselves with leaders outside the Belize Valley or emphasizing their difference from commoners. Additionally, the Maya at upper-level sites chose to inter the deceased in newly built architecture more frequently than those at other sites. This suggests greater access to resources and emphasis on building funerary monuments for individuals among the elite. Rather than emphasizing community, leaders at the major

centers emphasized individuals.

There was also variability within ancient Maya mortuary practices at lower-level sites, although they chose to participate in the broad mortuary schema as well. The dead were consistently interred in the traditional manner, and there was little evidence of participation in the variety of body treatments and burial facilities in which their contemporaries at mid-level and upper-level sites participated. Given the extensive occupation of the Belize Valley, however, settlements outside the site centers is still not completely understood. This is in part due to modern destructive initiatives; for example, the settlement around Cahal Pech is nearly entirely under the modern town San Ignacio. Additionally, a large part of the burials from lower-level sites described here are from Barton Ramie, possibly biasing results.

McAnany's (2013[1995]) model for ancestor veneration as an integrative force in sociopolitical organization, power, and worldview for mid-level communities, finds some support from archaeological correlates. Eastern structures were clearly important at many sites, but other contexts were chosen for repeatedly interring human remains. Males were interred in eastern structures of mid-level sites more frequently than females during all time periods, but this does not reach statistical significance. If all site types are considered (low-, mid-, and upper-level), males and females are interred equally in eastern structures in the Late Classic, the time period with the most sufficient sample size. The living engaged with burial features and skeletal remains but not as often as elites did. The practice of placing the deceased in eastern structures only slightly pre-dates the establishment of kingship in the Maya lowlands, which is consistent with McAnany's (2013[1995]) model specifying that Classic period kings appropriate and

politicized ancestor veneration. Plaza burials, however, date to the Middle Preclassic and may have been an earlier version of ancestor veneration (Brown 2015). Regardless, the complex mortuary tradition involving re-entering burials long before the institution of kingship is supported by data from the Belize Valley.

I argue that while McAnany's model is not a perfect fit, ancestor veneration did occur. Establishing an enduring mortuary tradition anchored in the built environment is a strong ancient Maya tradition and display of power. The implications of my findings for sociopolitical organization are that some of the minor centers could be considered segmentary lineages based on the establishment of an ancestral shrine. For example, the site of Zubin seemed to have served a ritual purpose until the Late Classic when it took on a residential and administrative focus (Iannone 1996). With this came the establishment of an eastern structure wherein fifteen individuals were interred over the duration of the site's occupancy. It is possible that a lineage faction established itself at this location and solidified its power within the regional sociopolitical milieu of the Belize River Valley (Iannone 1996). An eastern temple symbolizes this achievement. There is not, however, evidence of bundled or secondary burials associated with community establishment, which would be expected if ancestral bundles containing skeletal remains were an important sign of group continuity during and after migration, as they were for the ethnohistoric Quiche Maya. Overall the distinct variation in mortuary practices is ever more apparent as excavations continue in the Maya lowlands.

Conceptual and Methodological Contributions

Not only is it necessary to continue to develop methodological tools, but scholars must also continue to think carefully about ancient Maya worldview and the principles that underlie this complex mortuary record. While considerable variability in the ancient Maya mortuary record is common, this makes sense in light of contemporary perspectives on Maya worldview presented in Chapter 2 and 3. Today the Western concept of sacred and profane, championed and extended by Eliade and others (Eliade 1959, 1990; Freidel 1992; Schele and Freidel 1990), are still used to interpret ancient Maya behavior. However, human remains in the Belize Valley were not always set apart and curated carefully like one curates a "sacred" object. They were disturbed, disarticulated, moved, possibly for purposes of ancestor veneration, but in some cases the disturbance was almost certainly accidental. Bones were deposited both carefully and without apparent forethought suggests that they were not categorically considered ritual items. Extra skulls or long bones are placed within another grave context or within a cache, but sometimes they are found in construction fill and trash middens. "Sacred", as it is used in Western religious settings, is simply inappropriate for describing the treatment of human bone by the ancient Maya of the Belize Valley.

This is further supported by the varied contexts within which there is evidence for re-entry. McAnany's (2013 [1995]) model stipulates that reciprocal interactions may occur more frequently within eastern structures. While eastern structures were an important locale for interment for all communities over time, the types of deposits placed in eastern structures (multiple individual burials, secondary burials, etc.) are also placed in other architectural forms. There was not one, exclusive architectural context wherein

mortuary practice had to occur at mid-level sites. The other contexts where human bone was deposited include community spaces – plazas and round structures – emphasizing that if mortuary practices can be considered a way to build and sustain communities then mid-level sites are the nexus of community building in the Belize Valley. This exemplifies that there is not a single correct manner or location at which to engage in a reciprocal relationship with the deceased. Given what we know about the Maya worldview, from ancient times to today, variability can be explained as iterations of an overarching ideology engaged with for various reasons with various effects by different parts of society. The archaeological signature of this worldview is complex. Given this variability, detailed and precise methodologies are crucial for future research.

Aspects of the taphonomic part of this study could not be fully implemented due to skeletal preservation. However, given the large size of the collection and the number of projects from which data was collected for this dissertation, it was possible to extract considerable information. This is a testament to the quality of archaeological research done in the Belize Valley. The skeletal collection from the Belize Valley will continue to grow, and I argue that consistent and thorough documentation of grave contexts will continue to be important for furthering our understanding of the mortuary record and its relationship to social organization and power. Tiesler and colleagues (2010) found that body treatments varied per individual throughout the use of a single grave context. That level of detail was possible due to mapping and documenting each skeletal element and its location with respect to correct anatomical position. Preservation will always be an issue in the Maya region, however the positioning of skeletal elements is often clear while the bones are still in the ground.

Therefore, documentation by a bioarchaeologist during excavation is crucial for accurate representations of past processes.

Conclusion

In closing, I step back from the specific results of the study to consider broader implications and how to move forward. This work contributes in two ways to the field of Maya mortuary studies. Firstly, it demonstrated that it can be productive to re-assess material excavated when Maya archaeology was in its infancy. New approaches and new analytical methods indicate that researchers should approach older collections to flesh out analyses before excavating new material. It shows that novel information provides obtained that proved a fresh look at old bones. These collections should be incorporated into the research designs as quickly as possible, as museums are facing closure due to shortsighted budget cuts (https://savetheillinoisstatemuseum.wordpress.com/). Secondly, this study brings to the fore a method that allows mortuary archaeologists to construct better arguments for the multitude of processes that affected the production of the archaeological record.

Future research will expand analyses presented here to include non-funerary contexts, grave goods, and body modification (cranial and dental). These data sets will provide further insight into who was chosen for interment in particular locations and why. Artifact patterning may paint a clearer picture of the lifetime roles of those interred in ancestral contexts. If human bone was not made a ritual object by leaders at mid-level sites, other avenues of ritual communication should be explored. For instance, a stingray

spines and obsidian blade fragments were found in graves in the eastern structure at Chan (Novotny 2012). Royal iconography depicts leaders letting blood on bark paper to burn as offerings to ancestors. The presence of bloodletting implements suggests an alternate form of communication with deceased ancestors through the living human body.

Finally, we should strive towards better links between theory and data. The practice theory presented in Chapter 3 provides an organizing, synthesizing framework for the data on ancient Maya mortuary practices and worldview. I value the broad analytical framework social theories provides, particularly related to the relationship between the individual and society, or an individual and a social institution. Future research will continue to integrate theory and data so that these theories may be more useful for analyses of social behavior. In the ancient Maya case presented here, an intriguing avenue of research will be the agency of non-human beings and how they were materialized. Ongoing research concerning the enduring agency of the deceased is needed to bring balance to our archaeological worldview, as we investigate the reciprocal relationships between living and deceased ancient Maya (Arnold 2014; Betsinger and Scott 2014; Crandall and Martin 2014; Tung 2014; Velasco 2014).

The ancient Maya mortuary record is rich and complex, and it holds a wealth of information on ancient Maya worldview, social organization, and the historical processes that informed their expression in the archaeological record. Excavators should not be deterred by poor preservation of osseous materials in the Maya region but seek methods such as archaeothanatology that maximize the information provided by this tantalizing archaeological record. The integration of multiple lines of bioarchaeological evidence allows scholars to access this rich dataset and bring our understanding of the ancient Maya to new levels.

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APPENDIX A

BIOARCHAEOLOGY DATABASE VARIABLES

TIME SPANS

Phase	Calendar Years
Early Middle Preclassic	1100-900 B.C.
Middle Preclassic	650-300 B.C.
Late Preclassic	300 B.C. - A.D. 100/150
Terminal Preclassic	A.D. 100/150-250
Early Classic	A.D. 250-600
Early Late Classic	A.D. 600-670
Late Late Classic	A.D. 670-800/830
Terminal Classic	A.D. 800/830-900
Early Postclassic	A.D. 900-1200
Preclassic	750-100 A.D.
Late Classic	600-900 A.D.
Unknown	Unknown

CONTEXT

Site Type
(Ashmore 1981, Iannone 2004)

Lower-level settlement (residential, patio, plazuela groups)
Mid-Level settlement (minor ceremonial centers)
Upper-Level settlement (major ceremonial centers)

Type of Architecture

Lower-level (plazuela, house group)
- Residence
- Non-residence: Plaza
- Non-residence: Ritual, East
- Non-residence: Ritual, other
- Non-residence: Unknown function
- Unknown

Mid-level sites (5m pyramid, 1-2 plazas etc)
- Residence
- Public: Plaza
- Public: Ritual, East
- Public: Ritual, other

Public: Admin
Public: Round
Public: Terminus group
Public: Range structure
Public: Unknown
Unknown function

Upper-level (Large pyramid temples, palace, ballcourts etc)
Residence: Palace
Residence: Non-palace elite
Public: Plaza
Public: Ballcourt
Public: Sacbe
Public: Terminus group
Public: Temple, East
Public: Tempe, other
Public: Ritual, other
Public: Range structure
Public: Unknown function
Unknown function

Grave type
(Welsh 1988)

See Appendix B

BODY POSITION AND ORIENTATION

Body Position
(Sprague 2005:30)

Extended (180°)
Flexed (180-90°)
Semi-flexed (90-10°)
Tightly flexed (10°)

Arm/Hand Position
(Sprague 2005:30)

Along the sides
Hands on pelvis
Hands beneath pelvis
Hands on chest
Hands beneath chest
Hands to the shoulders
Hands beneath shoulders

Hands to the face or head
Wrapped around the legs
Forearms across abdomen
Forearms beneath abdomen

Leg Position

Feet parallel
Feet crossed at ankles
Reversed knee flexed (180-360°)

Head Orientation

North
South
East
West

Face Orientation

North
South
East
West

Deposition
(Sprague 2005:31)

Prone
Supine
Left side
Right side
Seated

Form of Disposal
(Sprague 2005:28)

Primary
Secondary
Indeterminate

Body Preparation
(Sprague 2005:29)

Wrapping
    Shoulders

Legs
Feet
Clothing
Painting (cinnabar application)

Individuality (Sprague 2005:29)
(Duday 2006)

Single individual
Multiple individual (2+)
Simultaneous
Sequential

Articulation
(Sprague 2005:29)

Articulated
Semi-articulated
Disarticulated
Disturbed

Age Ranges
(Buikstra and Ubelaker 1994)

Infant (I) 0-3
Child (C) 3-12
Adolescent (Ao)12-18
Young Adult (Yad) 18-35
Middle Adult (Mad) 35-50
Old Adult (Oad) 50+
Unspecified Adult (UA)

Sex
(Buikstra and Ubelaker 1994)

Male (M)
Female (F)
Possible Male (M?)
Possible Female (F?)
Unidentifiable (U)

TAPHONOMY

General preservation
(Gordon and Buikstra 1981).

1-8

Element presence and completeness
(Buikstra and Ubelaker 1994)

Element
- Proximal Epiphysis
- Proximal 1/3
- Middle 1/3
- Distal 1/3
- Distal Epiphysis

Completeness
- 0-25%
- 25-75%
- 75-100%

Surface preservation

Intact surface area/Degree of surface preservation

Poor: 0-25%
Moderate: 25-75%
Good: 75-100%

Curation or excavation marks
- Present/absent

Surface marks (White 1992)
- Root etching
- Exfoliation
- Pitting
- Cracking
- Flaking
- Changes to shape (crushing)
- Polish

Location of marks (if applicable)

Coloration

Bone type
- Munsell
- Location (if applicable)

Fracture

Present/absent
    Ancient
    Recent

Scavenging

Tooth marks

Cutmarks

Present/absent
Location

Re-fitting

Present/absent
Bone type
Location

Burning

Present/absent
Bone type
Location

Weight

Element
Weight

APPENDIX B

GRAVE TYPES

My own typology and classification is based on the morphology of 1170 graves from 16 different sites, and although by no means exhaustive it is hoped and expected that the size and variety of the sample will incorporate all the morphological differences in lowland Maya graves.

The classification closely follows the types established by A.L. Smith as well as accounts for the extensive variety revealed by Tourtellot. One way of describing the total morphologicalrange of Maya graves is by a type- variety system of classification the system consists of types based on defined morphological attributes, and varieties within each type based on minor attribute variations. [Welsh 1988:16]

Type I. Simple:

Interment in an unlined hole or pit in the ground or structural fill, or inclusion of a body in fill during construction. Any stone that may be present was not intentionally placed for interment, but used if available.

Varieties:

1. simple – formelss grave in construction fill opportunistically made during structural reconstruction
2. pit – unlined hole or pit dug into soil, bedrock, fill or rubble
3. ceiling slab – the corpse, or portion of it, i.e. the head, rested on stone slab of a pre-existing stone capped grave
4. blocked up room – technically should be included with simple variety but is considered a separate variety to account for the confused descriptions of burials in Rooms 1 to 4, Str. B, Group II, Holmul, and the graves of Burials T1-40, Copán, and 18, Mountain Cow
5. interment placed between existing stone lined graves, benches, or room walls and thus forming the illusion of being stone lined when in fact there was no special grave preparation.

Type II. Chultun

Large chamber originally dug out of the soil and/or bedrock for purposes other than mortuary, and with or without a shaft. No varieties.

Type III. Cist

Outlined grave consisting of stone lining on at least one of its sidewalls, cap or floor, but rarely, if ever, being completely lined with stone; or intentional placing of stone, frequently haphazard, directly on or around skeleton as a means of separation and protection from other graves. The fact that stone was used distinguishes it from simple graves and because it was not completely stone lined on all sides distinguishes it from crypts. Cists were rarely capped if stone lining was present.

Varieties:

1. haphazard cist – randomly piled or placed stones lying directly on, or haphazardly placed around, corpse; probably so placed in order to separate burial from others surrounding it and thus, although the placing of the stones may appear haphazard, the act of placing them was intentional
2. partial cist – use of rough, unshaped stones of rubble fill placed as a partial or incomplete lining around, under or over, body. Rather similar to above variety but less haphazard in appearance. Frequent use of existing structural walls as additional lining to grave
3. head cist – grave in which some sort of stone, mortar or plaster lining has been placed on, under or around, cranium of corpse for protection, and with little or no attention paid to protecting the rest of the body
4. capped pit – an unlined, or partly walled pit, partly or totally covered by capstones resting on at least one, but normally both, sidewalls
5. uncapped cist – grave partly or completely lined by a crude ring of unshaped stones, boulders, or rough, vertically placed slabs. Some grave walls may be covered with plaster. None was capped.

Type IV. Crypt

Grave constructed with partly or completely stone lined walls and always covered by capstones for a ceiling. May or may not have a plastered floor. Some crypts were more complex or elaborate than others by their greater dimensions and/or more carefully placed stones in a more complex stone wall construction, i.e. well cut horizontally placed stone slabs, as opposed to vertically positioned, roughly shaped slabs.

Varieties:

1. unspecified crypt – designated as a crypt by excavators but, because of disturbance or inadequate description and illustration, the actual sophistication of construction of the grave is uncertain, though the excavator's implication that the grave was a crypt is accepted, i.e. stone walls with a capstone
2. simple crypt – grave whose walls are usually lined, or partly lined, with vertically placed stone slabs or unshaped stones, and roofed with capstones. Walls, floors and capstones may be covered with plaster. Height of 10-75cm.
3. elaborate crypt – grave whose walls are lined with stone slab, often horizontally placed, and capped with cut and dressed capstones. May occasionally have stone floors, niches in walls, and/or benches along sidewalls. Walls, floor and or capstones sometimes covered in plaster. May contain an antechamber. Height is higher than the simple crypt variety, ranging from 40 -135cms.

Type V. Tomb

An elaborate stone lined or rock-cut chamber of considerable dimensions, far exceeding those of the corpse. Usually contains a shaft leading down to the chamber, with an occasional antechamber. Height is sufficient for a human to stand, i.e. ca. 135cms or

more. Tombs may be vaulted or have vertical walls with a cap. Walls, floor and ceiling are usually plastered and/or painted.

Varieties:

1. unspecified tomb – insufficient description to determine precise nature of construction and/or dimensions, but accept author's implication that it was a tomb
2. rock-cut tomb – large chamber cut out of bedrock, complete with shaft and steps leading to tomb entrance. Walls and ceiling usually covered in plaster and line paintings
3. stone lined tomb – large chamber lined with stone and either vaulted or capped with stone slabs. May have shaft and steps leading to chamber.

Type VI. Unclassifiable or Unknown

Graves in which there was insufficient or no information, or they were too disturbed to determine morphology. Hence, it was not possible to know what these graves were nor how to classify them.

APPENDIX C

DENTAL METRIC DATA SUMMARY TABLE

Site		ULI1MD	ULCMD	ULP1MD	ULM1MD	ULI1BL	ULCBL	ULP1BL	ULM1BL
Actuncan	COUNT	1	2	2	1	2	2	2	1
	MEAN	6.72	6.04	4.87	8.23	6.61	7.89	8.08	11.16
	STDEV	NA	0.03	0.22	0.00	0.13	0.54	0.19	0.00
Baking Pot	COUNT	5	7	7	4	5	8	5	2
	MEAN	6.46	6.18	5.27	8.87	6.52	8.18	8.35	10.65
	STDEV	0.51	0.66	0.60	0.48	0.21	0.68	0.96	2.16
Barton Ramie (+LD)	COUNT	25	19	18	19	24	21	16	15
	MEAN	6.47	5.68	4.72	8.36	6.58	7.96	8.27	10.06
	STDEV	0.51	0.42	0.40	1.11	0.50	0.98	0.69	0.89
Chaa Creek	COUNT	2	2	3	4	3	2	3	4
	MEAN	7.33	5.99	5.06	8.23	7.11	7.73	8.30	10.98
	STDEV	0.30	0.18	0.33	0.78	0.50	0.25	0.64	0.16
Cahal Pech (+TZ, TK)	COUNT	1	2	2	2	1	1	2	1
	MEAN	7.04	6.11	5.53	7.99	6.74	8.36	9.14	11.52
	STDEV	NA	0.23	0.41	0.22	NA	NA	1.00	NA
Saturday Creek	COUNT	0	1	3	2	1	1	3	2
	MEAN	NA	6.29	4.67	8.24	6.54	8.53	7.92	10.57
	STDEV	NA	NA	0.43	0.17	NA	NA	0.55	0.49
San José	COUNT	9	9	9	8	9	9	10	8
	MEAN	6.42	6.06	5.14	8.11	6.63	8.36	8.60	10.87
	STDEV	0.37	0.42	0.22	0.36	0.43	0.69	0.59	0.52
Xunantunich	COUNT	3	3	3	3	3	3	3	3
	MEAN	5.26	5.16	4.79	5.49	5.35	6.02	6.40	6.46
	STDEV	4.43	4.36	4.40	4.44	4.43	4.62	5.08	5.34
Zubin	COUNT	1	3	4	3	1	3	4	3
	MEAN	6.56	5.88	4.74	8.29	6.89	8.27	8.13	11.40
	STDEV	NA	0.15	0.13	0.41	NA	0.40	0.50	0.22

Chan	COUNT	1	3	1	3	2	3	1	2
	MEAN	7.06	6.89	5.99	8.28	6.82	8.48	8.94	11.13
	STDEV	NA	0.26	NA	1.35	0.04	0.51	NA	1.22
Chan NE	COUNT	1	2	0	0	2	1	0	0
	MEAN	6.53	6.09	NA	NA	7.28	8.42	NA	NA
	STDEV	NA	0.36	NA	NA	0.89	NA	NA	NA

Site									
Actuncan	COUNT	**LLI2MD**	**LLCMD**	**LLP1MD**	**LLM1MD**	**LLI2BL**	**LLCBL**	**LLP1BL**	**LLM1BL**
	MEAN	0	1	1	2	0	1	1	2
	STDEV	NA	5.74	5.13	11.83	NA	7.80	7.31	10.71
Baking Pot	COUNT	NA	NA	NA	2.04	NA	NA	NA	1.56
	MEAN	2	8	5	5	5	9	4	2
	STDEV	4.00	5.39	5.32	8.56	5.86	7.50	7.46	8.94
Barton Ramie (+LD)	COUNT	0.08	0.41	0.38	2.06	0.09	0.39	0.66	0.01
	MEAN	14	3	12	12	14	3	12	6
	STDEV	3.81	5.47	4.92	9.31	5.94	7.97	6.81	8.87
Chaa Creek	COUNT	0.29	0.54	0.36	0.80	0.40	0.96	0.44	0.57
	MEAN	2	2	3	2	2	2	3	2
	STDEV	4.40	6.96	5.47	10.37	6.00	6.62	7.08	10.09
Cahal Pech (+TZ, TK)	COUNT	0.49	2.06	0.33	0.52	0.47	0.83	0.37	0.35
	MEAN	1	0	0	2	1	0	1	2
	STDEV	4.63	NA	NA	10.23	6.31	NA	6.54	9.32
Saturday Creek	COUNT	NA	NA	NA	0.34	NA	NA	NA	0.26
	MEAN	1	2	0	1	3	3	0	1
	STDEV	4.40	5.64	NA	9.81	6.10	7.77	NA	9.24
San José	COUNT	NA	0.38	NA	NA	0.14	0.52	NA	NA
	MEAN	1	4	5	3	1	4	5	3

	STDEV	4.01	5.53	5.12	9.84	5.98	7.79	7.32	9.45
Xunantunich	COUNT	NA	0.30	0.24	0.32	NA	0.93	0.45	0.02
	MEAN	1	2	2	2	1	2	2	2
	STDEV	4.01	2.92	2.68	5.08	5.98	4.36	3.89	4.74
Zubin	COUNT	NA	3.70	3.45	6.73	NA	4.85	4.86	6.67
	MEAN	3	3	5	2	4	3	5	2
	STDEV	4.34	5.84	5.31	10.08	5.82	8.07	7.00	9.98
Chan	COUNT	0.35	0.78	0.46	0.63	0.36	0.43	0.44	1.02
	MEAN	2	0	0	2	2	0	0	1
	STDEV	4.77	NA	NA	9.85	6.51	NA	NA	10.03
Chan NE	COUNT	0.20	NA	NA	0.44	0.01	NA	NA	NA
	MEAN	1	1	3	0	1	3	1	0
	STDEV	3.76	5.74	5.07	NA	5.39	7.84	6.85	NA
		NA	NA	0.05	NA	NA	0.21	NA	NA
Site									
Actuncan	COUNT	**LRM1MD**	**LRP1MD**	**LRCMD**	**LRI2MD**	**LRM1BL**	**LRP1BL**	**LRCBL**	**LRI2BL**
	MEAN	1	0	0	0	1	0	0	0
	STDEV	13.49	NA	NA	NA	11.77	NA	NA	NA
Baking Pot	COUNT	NA	NA	NA	NA	NA	NA	NA	NA
	MEAN	2	3	1	1	3	2	1	0
	STDEV	9.84	5.46	6.42	4.51	9.26	7.81	8.81	NA
Barton Ramie (+LD)	COUNT	0.18	0.47	NA	NA	0.59	0.11	NA	NA
	MEAN	6	10	10	6	6	7	10	6
	STDEV	9.23	4.86	5.58	3.95	8.80	7.01	7.34	5.75
Chaa Creek	COUNT	0.73	0.31	1.04	0.44	0.74	0.66	0.76	0.58
	MEAN	0	2	1	2	0	2	1	2
	STDEV	NA	5.20	5.44	4.32	NA	6.66	7.21	6.22
Cahal Pech (+TZ, TK)	COUNT	NA	0.30	NA	0.42	NA	0.19	NA	0.18

	MEAN	2	2	0	1	1	3	0	2
	STDEV	9.96	5.38	NA	4.70	9.71	7.46	NA	6.40
Saturday Creek	COUNT	0.52	0.15	NA	NA	NA	0.82	NA	0.18
	MEAN	1	3	0	1	1	2	0	0
	STDEV	9.45	4.98	NA	4.21	9.10	6.58	NA	NA
San José	COUNT	NA	0.21	NA	NA	NA	0.06	NA	NA
	MEAN	5	4	5	4	4	3	3	4
	STDEV	9.25	5.12	5.49	4.09	8.64	7.15	7.90	6.00
Xunantunich	COUNT	0.49	0.31	0.19	0.25	0.29	0.38	0.27	0.22
	MEAN	2	2	2	2	2	2	2	2
	STDEV	4.87	2.72	2.84	2.17	4.47	3.77	4.09	3.11
Zubin	COUNT	6.19	3.40	3.75	2.72	5.90	4.79	5.40	4.09
	MEAN	0	1	2	0	0	2	2	0
	STDEV	NA	4.61	5.55	NA	NA	6.70	7.17	NA
Chan	COUNT	NA	NA	0.80	NA	NA	0.92	1.45	NA
	MEAN	1	2	5	3	2	2	5	3
	STDEV	11.10	5.16	5.93	4.46	9.19	7.38	8.13	5.90
Chan NE	COUNT	NA	0.14	0.40	0.58	1.35	0.42	0.24	0.31
	MEAN	0	0	0	1	0	0	0	1
	STDEV	NA	NA	NA	3.93	NA	NA	NA	6.40
		NA	NA	NA	NA	NA	NA	NA	NA
Site									
Actuncan	COUNT	**URM1BL**	**URP1BL**	**URCBL**	**URI1BL**	**URM1MD**	**URP1MD**	**URCMD**	**URI1MD**
	MEAN	1	2	1	1	0	2	1	2
	STDEV	6.51	8.38	8.44	6.42	NA	5.15	6.91	6.63
Baking Pot	COUNT	NA	0.21	NA	NA	NA	0.25	NA	0.28
	MEAN	4	3	5	0	4	4	4	0
	STDEV	11.02	8.25	7.91	NA	8.22	4.90	5.77	NA

Barton Ramie (+LD)	COUNT	0.47	0.76	0.51	NA	0.32	0.71	0.33	NA
	MEAN	5	5	11	6	7	4	11	5
	STDEV	9.84	8.19	8.22	6.69	8.25	4.79	5.92	6.29
Chaa Creek	COUNT	1.02	0.23	0.66	0.39	1.63	0.26	0.39	0.51
	MEAN	2	2	3	2	2	2	3	2
	STDEV	11.20	9.08	8.71	7.53	8.46	5.64	6.45	6.71
Cahal Pech (+TZ, TK)	COUNT	0.06	0.24	0.18	0.05	0.91	0.69	0.08	0.60
	MEAN	1	0	3	1	2	0	3	2
	STDEV	11.19	NA	6.76	7.12	8.15	NA	7.37	7.55
Saturday Creek	COUNT	NA	NA	1.69	NA	0.25	NA	0.85	0.69
	MEAN	1	1	0	1	1	1	0	1
	STDEV	9.97	7.62	NA	6.93	8.55	4.42	NA	7.30
San José	COUNT	NA	NA	NA	NA	NA	NA	NA	NA
	MEAN	4	3	6	4	4	5	6	3
	STDEV	10.44	8.41	8.05	6.23	7.96	5.07	5.97	6.80
Xunantunich	COUNT	0.06	0.61	0.56	0.30	0.51	0.35	0.74	1.58
	MEAN	2	2	2	2	2	2	2	2
	STDEV	5.25	4.51	4.31	3.27	4.24	2.71	3.36	4.19
Zubin	COUNT	7.34	5.52	5.30	4.19	5.27	3.34	3.70	3.69
	MEAN	1	3	3	2	0	3	3	3
	STDEV	11.59	8.60	7.85	7.19	NA	5.22	5.91	7.86
Chan	COUNT	NA	1.01	0.26	0.10	NA	0.47	0.54	0.59
	MEAN	2	2	3	2	1	2	3	3
	STDEV	11.41	8.74	8.29	7.10	8.69	5.14	6.41	7.37
Chan NE	COUNT	0.21	0.52	0.42	0.60	NA	0.23	0.71	1.05
	MEAN	0	0	1	1	0	0	0	1
	STDEV	NA	NA	8.02	6.39	NA	NA	NA	6.93
		NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX D

MORTUARY DATA TABLES

Table 1. All sites and sample sizes used in the mortuary analysis.

Site	Count
Actuncan	7
Baking Pot	79
Barton Ramie	141
Bedran	14
Blackman Eddy	8
Buenavista	16
Cahal Pech	28
Cas Pek	11
Chaa Creek	17
Chan	26
Chan NE	10
Esperanza	6
Figueroa	5
Floral Park	10
Lower Dover	1
Ontario Village	1
Pacbitun	59
Pook's Hill	15
Rockville	6
San Lorenzo	3
Saturday Creek	12
Tolok	14
Tzinic	2
Tzotz	24
Xunantunich	35
Zopilote	4
Zubin	19
Total	573

Table 2. Sites codes used in burial numbers.

Code	Site
AC	Actuncan
BP	Baking Pot
BR	Barton Ramie
BD	Bedran
BE	Blackman Eddy
BV	Buenavista
CP	Cahal Pech
CK	Cas Pek
CC	Chaa Creek
CH	Chan
CN	Chan NE
ES	Esperanza
FG	Figueroa
FP	Floral Park
LD	Lower Dover
OV	Ontario Village
PA	Pacbitun
PH	Pook's Hille
RV	Rockville
SL	San Lorenzo
SC	Saturday Creek
TO	Tolok
TI	Tzinic
TZ	Tzotz
XU	Xunantunich
ZO	Zopilote
ZU	Zubin

Table 3. Age ranges and chronological age categories used in the study.

Abbreviation	Age Estimate	Age in Years
I	Infant	Birth to 3 years
C	Child	3-12 years
AO	Adolescent	12-20 years
UA	Unspecified Adult	20-50+ years
YAd	Young Adult	20-35 years
MAd	Middle Adult	35-50 years
OAd	Old Adult	50+years

Table 4. Sample sizes for each age range by site.

Site	Infant Birth-3 years	Child 4-12 years	Adolescent 13-20 years	Young Adult 21-35 years	Middle Adult 35-50 years	Old Adult 50+ years	Total
Actuncan	0	2	0	0	0	0	2
Baking Pot	4	6	0	7	7	10	34
Barton Ramie	7	10	3	13	2	10	45
Bedran	0	0	0	0	0	0	0
Blackman Eddy	1	1	0	1	0	0	3
Buenavista	1	4	4	2	2	0	13
Cahal Pech	0	1	4	6	2	3	16
Cas Pek	0	1	1	0	1	0	3
Chaa Creek	0	1	0	3	2	4	10
Chan	0	3	1	8	2	0	14
Chan NE	0	0	0	0	0	0	0
Esperanza	0	0	0	0	0	0	0
Figueroa	0	0	0	0	0	0	0
Floral Park	0	0	0	0	0	1	1
Lower Dover	0	0	0	0	0	0	0
Ontario Village	0	0	0	0	0	0	0
Pacbitun	0	6	0	0	0	0	6
Pook's Hill	0	0	2	3	1	2	8
Rockville	0	0	0	0	0	0	0
San José	9	13	1	14	2	3	42
San Lorenzo	0	1	0	0	2	0	3
Saturday Creek	0	1	1	2	1	0	5
Tolok	2	2	0	1	3	1	9
Tzinic	0	0	0	0	0	0	0
Tzotz	0	0	0	1	0	0	1
Xunantunich	3	4	1	2	2	3	15
Zopilote	2	0	0	1	0	0	3
Zubin	0	1	0	5	4	0	10
Total	29	57	18	69	33	37	243

Table 5. Count of images available per site.

Site	Number of images
Actuncan	0
Baking Pot	43
Barton Ramie	65
Bedran	5
Cahal Pech	3
Cas Pek	0
Chaa Creek	13
Chan	26
Chan NE	6
Figueroa	5
Pacbitun	2
Pook's Hill	7
Rockville	0
San José	3
San Lorenzo	0
Saturday Creek	12
Tolok	7
Tzinic	0
Xunantunich	25
Zopilote	1
Zubin	13
Total	236

Table 6. Burial patterns for the Belize Valley

Variable	Variable state	Frequency	Percent
Deposition	Prone	174	66.92
	Supine	61	23.46
	Seated	13	5
	Right side	6	2.31
	Skull only	4	1.54
	Left side	2	.77
	TOTAL	260	100
Head Orientation	South	280	82.11
	North	24	7.04
	Seated	11	3.23
	West	11	3.23
	East	6	1.76
	Southeast	5	1.47
	Northeast	2	.59
	Southwest	2	.59
	TOTAL	341	100
Body Position	Extended	271	81.38
	Flexed	28	8.41
	Semi-flexed	17	5.11
	Seated	10	3
	Tightly flexed	5	1.5
	Bundled	2	.06
	TOTAL	333	100
Face Orientation	West	33	32.04
	Down	29	28.16
	East	27	26.21
	South	7	6.8
	Up	5	4.85
	North	1	.97
	Southwest	1	.97
	TOTAL	103	100
Disposal	Primary	266	88.67
	Secondary	34	11.33
	TOTAL	300	100
Grave Type	Simple	215	47.67
	Cist	99	21.95
	Crypt	99	21.95
	Tomb	14	3.1
	Within vessels	10	2.22
	Chultun	7	1.55
	Bedrock cist	6	1.33
	None	1	.22
	TOTAL	451	100
Intrusive	Intrusive	165	56.9
	Non-intrusive	125	43.1
	TOTAL	290	100
Articulation	Articulated	199	63.78
	Disarticulated	61	19.55
	Disturbed	52	16.67

Variable	Variable state	Frequency	Percent
	TOTAL	312	100
Individuality	Single	321	67.3
	Multiple (2+)	156	32.7
	TOTAL	477	100
Space	Filled	122	52.36
	Open	10	4.29
	Indeterminate	101	43.35
	TOTAL	233	100

Table 7. Summary of mortuary analysis results by site type.

	Lower-level sites	Mid-level sites	Upper-level sites
Deposition	Prone, consistent over time	**Prone, consistent over time in all locations.**	**Supine most common in non-eastern structures. Prone only common in the Late/Terminal Classic.**
Head Orientation	South is most common. Preclassic and Postclassic north predominates.	South in eastern structures, varies more in individuals in non-eastern structures. Consistent through time.	South in eastern structures, varies more in individuals in non-eastern structures. Consistent over time.
Body Position	Mostly extended, some flexed too.	Extended predominates, consistent over time, including eastern structures. More variability in non-eastern structures.	Extended predominates, consistent through time until the Postclassic, including eastern structures. More variability in non-eastern structures.
Face Orientation	No pattern	No pattern	No pattern
Disposal	Primary disposal predominates. Very few secondary. Sex: no pattern. Age: no pattern.	**Primary disposal predominates. Secondary burials occur throughout time but are not frequent. They are found in structures with a ritual function. Most common in multiple individual burials.** **Sex: males more closely associated with primary burials in eastern structures. Non-eastern structures both are associated with primary.** Age: no pattern	**Primary disposal predominates. Secondary burials occur only in the Late Classic and are located in a variety of locations, but are most common in eastern structures.** Sex: No pattern in eastern structures. In non-eastern both sexes associated with primary. Age: no pattern.
Grave Type	Simple predominates. Sex: no pattern. Age: no pattern.	Crypts and cists predominate. Variety early in time but cists and crypts predominate in Late Classic. Almost equally common in eastern and non-eastern structures. **Sex: males and females found in cists and crypts in eastern structures*** Age: no pattern.	Crypts most common early in time in all locations. Simple most common in both eastern and non-eastern structures in the Late Classic. Sex: males associated with crypts, females with cists in eastern structures. Age: no pattern.
Intrusive	Equal occurrence of intrusive and non-intrusive burials. Sex: no pattern. Age: no pattern.	Intrusive predominates through time, except Early Classic. Eastern structures more commonly have intrusive burials. Sex: females more commonly intrusive in eastern structures. Age: no pattern.	Non-intrusive predominates in Preclassic, intrusive in Late Classic. In eastern structures non-intrusive more common through time. Sex: both sexes associated with non-intrusive graves. No pattern in non-eastern structure.

	Lower-level sites	Mid-level sites	Upper-level sites
			Age: no pattern.
Articulation	Articulated predominates. Sex: no pattern. Age: no pattern.	**Disarticulated predominates in Preclassic, articulated predominates for subsequent time periods. Eastern structures always predominated by articulated skeletons.** **Sex: males associated with articulated interments in eastern and non-eastern structures, females with disarticulated and disturbed, respectively.** Age: no pattern.	**Disturbed common in Preclassic. Articulated predominates through time. Higher proportion of disarticulated and disturbed burials in Late Classic.** **Sex: both sexes cluster with disturbed interments at eastern structures and with articulated at non-eastern structures.** Age: no pattern.
Individuality	Single individual burial predominates. Multiple individual burial first in the Preclassic. Sex: no pattern. Age: no pattern.	**Single individual burials predominate over time. First seen in Terminal Preclassic and most common in Late Classic. Most common in eastern structures and other ritual locations.** Sex: no pattern. Age: no pattern.	**Single individual burials predominate through time. Multiple individual burials not seen until the Classic period and most common in the Late Classic. Eastern structures contain more single individual burials. Variation in location of multiple individual burials, not just ritual.** Sex: no pattern at eastern structures, females associated with single interments in non-eastern structures. Age: no pattern.
Funerary Space	Filled predominant Sex: no pattern Age: no pattern.	Filled predominant Sex: no pattern Age: no pattern.	Filled predominant Sex: no pattern Age: no pattern.
Timing of multiple interments	Over several centuries, and closer in time.	Over several centuries	Over several centuries
Structure type	Sex: no pattern. Age: no pattern.	Males correspond closely to eastern structures. Age: children distinct.	Females associated with eastern structures while males with western and other ritual locales Age: no pattern.

APPENDIX E

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